EDITORIAL

THE new minimum wage of $16 per week for women and minors will go into effect, according to an announcement by the Industrial Welfare Commission of California, as far as the manufacturing industries are concerned about November 15. General orders covering the manufacturing industries will be issued about September 15.

NOTABLE progress in the application of Diesel engines to marine propulsion was marked by the completion of the 'Cubore' by the Bethlehem Shipbuilding Corporation. The 'Cubore' is 469 feet long over-all with a dead-weight tonnage of 11,500. She is propelled by a two-cycle 3200-horsepower Diesel engine of Bethlehem design. She will be used for carrying iron ore from Cuba to the plants of the Bethlehem Steel Company.

ONE of the many opportunities for developing the manufacture and sale of machinery on the Pacific Coast was indicated recently by the shipment from Portland of a flour-mill, which is to be erected in the Tanana valley, Alaska, only 175 miles south of the Arctic Circle. The development by the Department of Agriculture of a hardy variety of wheat, maturing in 90 days, has caused the planting of so large an acreage in that vicinity as to justify the building of a mill.

AN alloy containing 90% of magnesium, and which weighs less than 70% as much as aluminum or aluminum alloys, has been developed by the Dow Chemical Co., of Midland, Michigan. It has a tensile strength of about 25,000 pounds per square inch, which may be doubled by forging and heat treatment. Its principal use so far has been for pistons for automotive engines. Unlike aluminum, the new alloy, when subjected to the temperatures reached in an automotive internal-combustion engine, acquires no appreciable permanent growth or set. The alloy is readily machined and pistons made from it do not score cast-iron cylinders.

MR. JOHN DONLIN of Chicago was recently elected president of the building trades department of the American Federation of Labor, which indicates the regard his fellow-unionists have for him. This honor, however, did not prevent his 'speaking right out in meeting' at the Montreal convention of the Federation. The statement below is taken from his annual report. "The wage-earner is just as much responsible for the high cost of living as any other agency. If every worker doing physical labor would insist that production equal that of pre-war times there would soon be a reduction in the price of commodities. The higher wages go and the more production falls off, the more the worker is going to be hurt."

THE Federal government paid its way during the fiscal year ended June 30, for the first time since we entered the War in which, thanks to President Wilson and the Senate, we are still engaged. Receipts were $6,694,565,388, or more than twice the National debt at the close of the Civil War, while expenditures were $6,403,343,841. The apparent surplus was entirely due to partial liquidation of the assets of the War Finance Corporation, and if these transactions were eliminated, the comparatively small deficit of $71,000,000 would be shown. However, it is interesting to learn that our feet are at least in process of returning to the earth, although the situation can hardly be called satisfactory even yet.

HISTORIANS tell us of a certain king of France, who, with a considerable retinue, "marched up a hill and then marched down again". A somewhat similar performance was staged recently by the California Automobile Trade Association, which on June 5 last adopted a resolution implying that the shortage of gasoline is the result of manipulation by the oil companies and calling for a Federal investigation of the question. However, the members of the Association are good sports and fair-minded, even if they are a bit hasty at times, so their representatives made an investigation of their own, and on July 14 reported that there was no evidence to substantiate the charges made, and expressed regret that they had been brought.

STRANGE as it may seem, many foreign-born residents of the United States have acquired the idea that living conditions in 'the old country' are better than they are here. Confronted with the high cost of living here, their minds linger fondly on prices in Europe prevailing when they left for America several years ago, and they calculate how long they could live on their savings at the old commodity prices, forgetting that the cost of living has increased much faster throughout Europe than in the United States, and that many commodities, plentiful in this country, are practically unobtainable at any price in most of Europe. To prevent such foreign-born residents from being disappointed and to assist employers in holding their foreign labor, the Inter-Racial Council, 233 Broadway, New York, has established an information service for collecting and distributing reliable information regarding living conditions in the European countries.

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A New Deal Coming

A recent decision of the Industrial Court of Great Britain is of importance because it lays down a new principle in deciding claims for wage increases. Hitherto, the tendency in Great Britain, as elsewhere, has been to make wage increases in accordance with increases in the cost of living. As a rule, provisions were also made for rehearings every four months, with the consequent probability of an increase as a result of each rehearing. The 'vicious circle' was much in evidence, everyone devoting his energies to catching up with himself, and finding himself in the end no better off than when he started. The new decision, on the other hand, states that the value of the work done and not the cost of living must be the determining factor. This value of the work, the Court holds, depends upon the state of the market and the demand for the products of the workshop. Wages, therefore, should bear a direct relation to production, rather than to the cost of living. Perhaps we are in error in stating that this decision of the Court lays down a new principle. Is it not rather a return to the old principle of paying a man what he is worth? We are reminded of the man to whom such a proposition was put, and who replied, "I'm getting more than that now."

Cup Stays Here

Never since the exploit of the 'America' in 1851 has the Cup seemed so near to recrossing the Atlantic as during the competition last month. In fact, during the almost exactly fifty years since the first race with a challenger on August 8, 1870, the challenging yacht has seldom finished first. In that first race, by the way, the 'Cambria', the English challenger, was badly handicapped by being obliged to race against practically the entire fleet of the New York Yacht Club, and finished about the middle. Since then the Club has been more sportsmanlike, and has chosen a single defending yacht. The next year, the challenger 'Livonia', won one race out of five, largely because the defender 'Columbia' was disabled during the race, although finishing the course. From then until 1895, the record of victories by the defending yachts is unbroken. In the second race of that year, the challenger 'Valkyrie III' fouled her opponent, the 'Defender', and finished the race a few seconds ahead, but was disqualified and the race awarded to the 'Defender'. Sulky at this decision, Lord Dunraven, owner of the 'Valkyrie III', withdrew his yacht and allowed the third race to go by default, exhibiting a spirit that has happily not been shown before or since in these competitions. In 1901, the 'Shamrock II' finished ahead of the 'Columbia' in one race, but lost the race on account of the time allowance. So that the 'Shamrock IV', with one straight victory, and one that, although caused by an accident to the 'Resolute', was none the less earned, has done far better than any previous challenger. We are all glad of an American victory, but, if the Fates had decreed otherwise, there is no man to whom we would rather lose the Cup than the dead-game sport that has just made his fourth unsuccessful trial. Here's to you, Sir Thomas Lipton, and may you live long enough to send several more challengers to race for the Cup!

Financing the Business

Even the casual observer cannot fail to be impressed with the need for more capital of many of the metal-trades concerns on the Pacific Coast, particularly the smaller enterprises. This is largely because the small shop is usually a one-man or at most a two or three man concern. And that is one reason why it remains small. The proprietor usually started with a few hundred or a thousand dollars saved while he was working for wages. He used as much of this as he dared for his first payment to his machinery-dealer and supply-man, the amount of equipment he bought being mainly determined by the amount he ventured to take from his working capital. With prosperity came the need for further equipment, and also the need for more working capital to carry his accounts receivable. To strike a balance between these two needs calls for the exercise of fine judgment, but whatever division was made, he continues in debt to the machinery-house, and is seldom, if ever, able to take advantage of cash discounts. In fact, his one ambition is to get out of debt, although, as a matter of fact, that is the last thing of which a man with a sound and growing business should be thinking. However, he ought to be in debt to the right people, not to the various jobbers and supply-men, but to the people of his own community, either indirectly through borrowing at his bank, or directly, through incorporating his enterprise and the sale of stock. Inflation, as we all know, is objectionable, but if a man has a sound business and the opportunity to expand it, it is better for him to give the public a chance to share in it than either to refuse to expand it, or to spend months or even years skating on thin ice in the hope that his own funds and credit will stand the strain. Our unscientific system of taxation, especially the excess-profits tax, has militated against financing enterprises in which there is an element of risk, and has worked with particular disadvantage to the small company, but there is reason to hope for a change in this regard whichever party is successful in November.

Quality of Cast-Iron

The past generation or two has seen the substitution of steel and malleable-iron castings in the manufacture of many articles for which cast-iron was formerly standard, and this substitution continues to progress. This is largely because the service that the article or part is expected to deliver is such that the additional cost of either malleable iron or steel is justified, or because these materials are more suitable for other reasons. However, in many other instances the designer has decided against

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cast-iron because, rightly or wrongly, he felt that it was too uncertain a material for his purpose. Malleable-iron and cast-steel are each terms describing a material with definite qualities. Gray-iron, on the other hand, may be 'glass-hard' or easily machinable. Its tensile and transverse strengths may be low or relatively high. Other important properties may exhibit similar variations. It is true that the designer can specify the desired properties for his castings, but, ignoring the case where someone else besides the designer writes the specifications, the job may be too small to justify the drawing of specifications and the making of tests. In any case, the designer does not feel the same as if he knew, when he marked 'cast-iron' on his drawing, that it meant the same to everyone as it did to him. We have in mind particularly the case of one Bay District concern, making Diesel engines, which is casting cylinders from iron showing an ultimate strength of 35,000 to 42,000 pounds per square inch, and which, when subjected to the customary test of breaking an inch-square bar on 12-inch supports with a 3500-pound centre-load, showed a deflection of $\frac{1}{3}$ inch before breaking. These results are being obtained not once nor twice, but regularly. We do not mean to imply that it is worth while to try to obtain such qualities for such castings as sash-weights, but there are many articles and parts being made from malleable-iron or cast-steel today, for which such a high-grade cast-iron would serve as well, perhaps better, and at considerably less expense. It is up to the gray-iron founders to follow the example of the malleable-iron and steel men and to improve the quality and, particularly, the uniformity of their product. Sometimes this can be done by better selection of charging material. Sometimes the available pig and scrap will be of such a character that 'duplexing' the cupola and the electric furnace will be the best solution.

Railroad Wage Award

The Railroad Labor Board has at last announced its wage-award, although at this writing there is still some doubt whether or not all the unions will accept the decision. The total wage increase per year is estimated at $600,000,000, a tremendous sum, but one that does not sound nearly so large when we consider that it amounts to an average of only $25 per month for approximately 2,000,000 railroad employees. The layman, who has made no special study of the question, is not in a position to decide whether the new wages are too high or too low. The scale for shopmen, which is more directly comparable with that in other industries than, for instance, the trainmen's scale, appears just but not excessive. It is higher than the prevailing scale in some localities, and lower than the scale in others, including most Pacific Coast cities. The award is retroactive, dating back to May. The public, of course, will have to pay, in the form of taxes until September, when the six months' guarantee expires, and after that in the form of increased rates. However, increased rates are relatively unimportant if by that means we can be assured of adequate service. The condition of the country at the present time is almost without precedent. With few exceptions, the industries of the country have capacity and labor-supply sufficient for the needs of the country and for reasonable exports. Yet everybody is short of everything. The maker of semi-finished products cannot get deliveries on raw materials. The maker of finished products cannot get deliveries of either raw materials or of semi-finished products. The producer of raw materials cannot get deliveries on the equipment he needs in order to maintain production. Everywhere, transportation has 'fallen down'. Of what advantage is it to talk of more production if we cannot transport the goods we now produce? Of course, the various railroad strikes aggravated matters, but transportation facilities are inadequate anyway. The niggardly policy of the various regulating bodies has made it impossible for the railroads to secure the capital needed to provide adequate facilities. Nor do the provisions of the Esch-Cummins Act give much hope of immediate improvement. Under this Act, earnings by any railroad exceeding 6% on the investment are highly improbable. Yet a strong road like the Pennsylvania is obliged to pay 7%, not on short-term notes, but on securities running for ten years. What's the answer? Nobody likes to pay increased passenger and freight rates, but we can far better pay them than to continue as we have been doing.

A New Plan for Industrial Relations

The July issue of our contemporary, 'The National Labor Digest', under the heading of 'A Plan by Workers', outlines a scheme for the general organization of industrial relations that is worthy of careful attention and study. The anonymous authors state that they have each gone through the full course of unionism and are glad of it.

The plan is too comprehensive to be described in detail. Briefly, it provides for local unions composed of workers organized by trades, a shop conference-board in each plant, composed of labor members in association with company members, a State Federation of Labor in each State, composed of all the local unions in the State, a State Adjustment Board in each State composed of labor members from the State Federation of Labor in association with employer-members from a State Federation of Employers, to be organized, National unions composed of local unions of each trade or of certain trades, an American Federation of Labor composed of officials of National unions and having a National Executive Committee, and a National Arbitration Committee. This Committee is to be selected by the National Council of the Federation, and is to join with a similar committee from an American Federation of Employers, to be organized, together with representatives of the public, the whole forming a National Arbitration Board. Generally speaking, jurisdiction over matters affecting an individual plant would rest

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with each Shop Conference Board. Matters affecting the trade in general would be settled in accordance with agreements between the National unions and the National employers' organizations. The functions of both the State Federations and the American Federation would be mainly supervisory. They would also assist in the settlement of differences that the local or National bodies had been unable to compose. These bodies are also charged, along with the National unions, with the duty of keeping industry going in case individuals or local bodies refuse to accept an award duly made by the authorized adjustment boards.

Among the important aspects of the proposed plan, two are perhaps the most prominent. One is that the plan meets in large part, at least, some of the principal objections that both Labor and Capital have made to the plans proposed by the other side. Employers have objected to any form of union recognition because they objected to dealing with representatives not in their employ, and because they feared that union recognition ultimately meant the closed shop, a fear that, it must be admitted, was not entirely groundless. Labor men, on the other hand, have insisted on the closed union shop, or at least considered it as an ideal, largely because they feared that the open shop ultimately meant the closed non-union shop, and it must be admitted that this fear also was not entirely groundless. The works-councils and similar organizations developed by various employers, provide for the adjustment of matters affecting a single plant or group of plants along the same general lines as would be done by the proposed Shop Conference Board. However, the most enthusiastic advocates of the works-council idea would hardly claim that it furnishes protection from the unjust employer to either his employees or even to the better class of employers in the same line, who would prefer to maintain good wages and working conditions if it was not for the cut-throat competition of the unjust employer. Furthermore the works-councils do not, and cannot, adjust matters affecting an entire industry. We do not believe many persons, in this day and age, would claim that such matters should be adjusted by conferences between employers at which the employees would have no direct representation. Machinery for this representation is provided in the proposed plan.

The plan outlined, while perhaps not the best plan for handling industrial relations, would be a considerable improvement over the present system, or lack of system, provided that it could be put into effect. Here is the second prominent aspect of the question. Can it be put into effect? The plan calls for a complete reorganization of the American Federation of Labor, including a considerable increase in the centralization of authority and responsibility. We do not doubt that the Federation officials would like to see such a reorganization, particularly the accompanying centralization, but could they obtain it? Certainly, the tendency in labor circles during the past few years has been the other way. In New York the unions not affiliated with, and, to a considerable extent, opposed to, the Federation, have become so strong that they have recently formed a labor council of their own. In fact, there is little likelihood of a reorganization on the labor side even resembling that suggested in the proposed plan.

While labor is a long way from being as thoroughly organized as the proposed plan would require, the situation on the employers' side is even more chaotic. There is no American Federation of Employers. Such organizations as the Chamber of Commerce of the United States, the National Industrial Conference Board, and the National Association of Manufacturers resemble it only remotely. Neither do we know of any State where a State Federation of Employers along the lines proposed exists. Even the trade organizations are far from being inclusive. The National Metal Trades Association, for instance, comprises only a small proportion of the metal-trades shops of the country. There are hundreds of shops in the Bay district that are not affiliated with the California Metal Trades Association. Occasionally, fear of complete union domination forces nearly all the employers in a given locality into such an organization as the Merchants' & Manufacturers' Association of Los Angeles, but it is seldom that the activities of such a body extend beyond defense against union aggression.

However, the mere fact that the complete adoption of the plan in the near future is improbable neither condemns it nor removes it from the field of discussion. The plan provides machinery for the reduction, and the possible elimination, of strikes. It proposes no soviet system for the control of industry, but rather recognizes that the man paying the bills has a right to say how his business shall be run. It provides machinery for the protection of the rights of both the wage-earner and the man with the initiative and ability to go into business for himself. We doubt if the complete adoption of the plan would be either practicable or advisable, but we believe that ultimately our system of handling industrial relations will resemble the plan proposed more nearly than do any of our present systems.

Although, as has been pointed out, the present organization of industry differs widely from that of the proposed plan, one of the plan's important provisions, namely, adjustment of intershop matters by a shop-conference board composed of representatives of employers and employees with no outside union officials, and the adjustment, under trade agreements, of matters affecting the entire industry, is already in effect, to a greater or less degree in several industries. Probably the most notable example is in the factories employing members of the Amalgamated Clothing Workers, which union, by the way, is not affiliated with the American Federation of Labor, and does not insist upon the closed shop in its trade agreements. A local instance is the agreement between the Waiters Union of San Francisco and most of the higher-class restaurants and cafes. Lest it should be held that this provision of the plan is exclusively a labor idea, we would call the attention of our readers to its advocacy by Mr. Frank C. Drew in a signed editorial appearing in 'Metal Trades' for October 1918.

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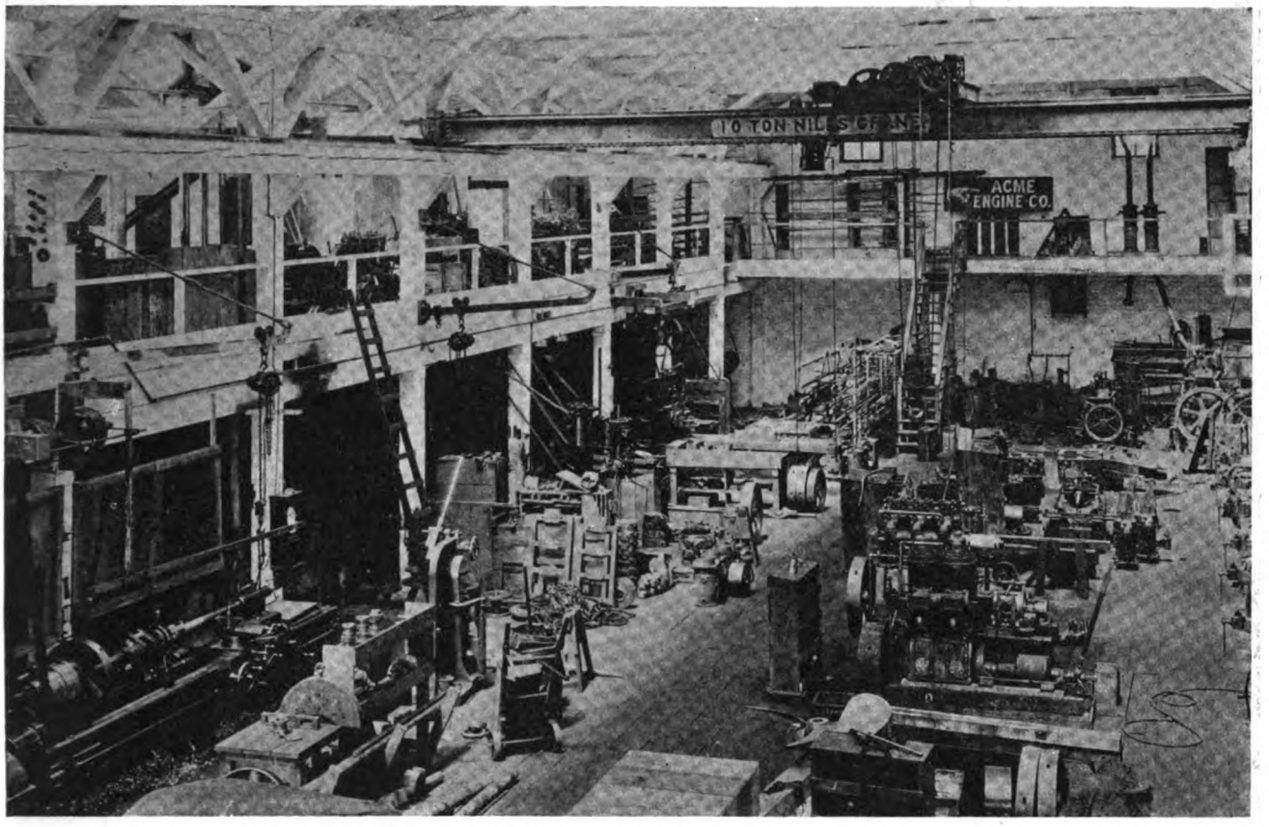


MAIN FLOOR OF THE SHOP

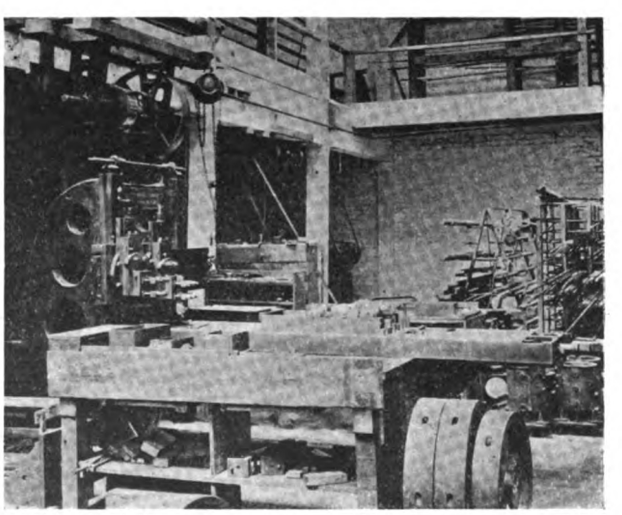
Manufacture of Gas-Engines by the Acme Engine Company

The need for more room and increased facilities recently compelled the Acme Engine Co. to move from its old quarters at 11 Minna street to the building formerly occupied by the Main Iron Works at 163 Main street. The building has been completely remodeled to suit the needs of the Acme company.

The plant consists of a main floor, 68 by 137 ft., and galleries, 17 by 137 ft., extending along both sides of the building. On one side of the main floor are the various machine-tools of the manufacturing department, while on the other side the assembling work is done. In the rear is the testing division, arranged for testing three engines at a time. To ensure sufficient water for the testing work, an underground concrete tank with a capacity of 15,000 gal. has been constructed. A 10-ton Niles crane of 35-ft. span runs at the gallery level, 19 ft. above the floor, serving the entire main floor.

Upstairs, on one side are the designing offices, toolroom, and automatic machines for small parts, while on the other is the equipment for grinding and polishing propellers, etc., as well as the pattern-storage department.

The Acme company manufactures heavy-duty marine gas-engines exclusively, ranging from one to six cylinders, and from 8 to 125 hp. These are designed for the continuous service desired by the power-boat operator, and for this reason both the manufacture and the assembly of engine parts are to closer limits than for an engine intended primarily for intermittent service. The cost of



MACHINING BEARINGS ON HAMILTON PLANER

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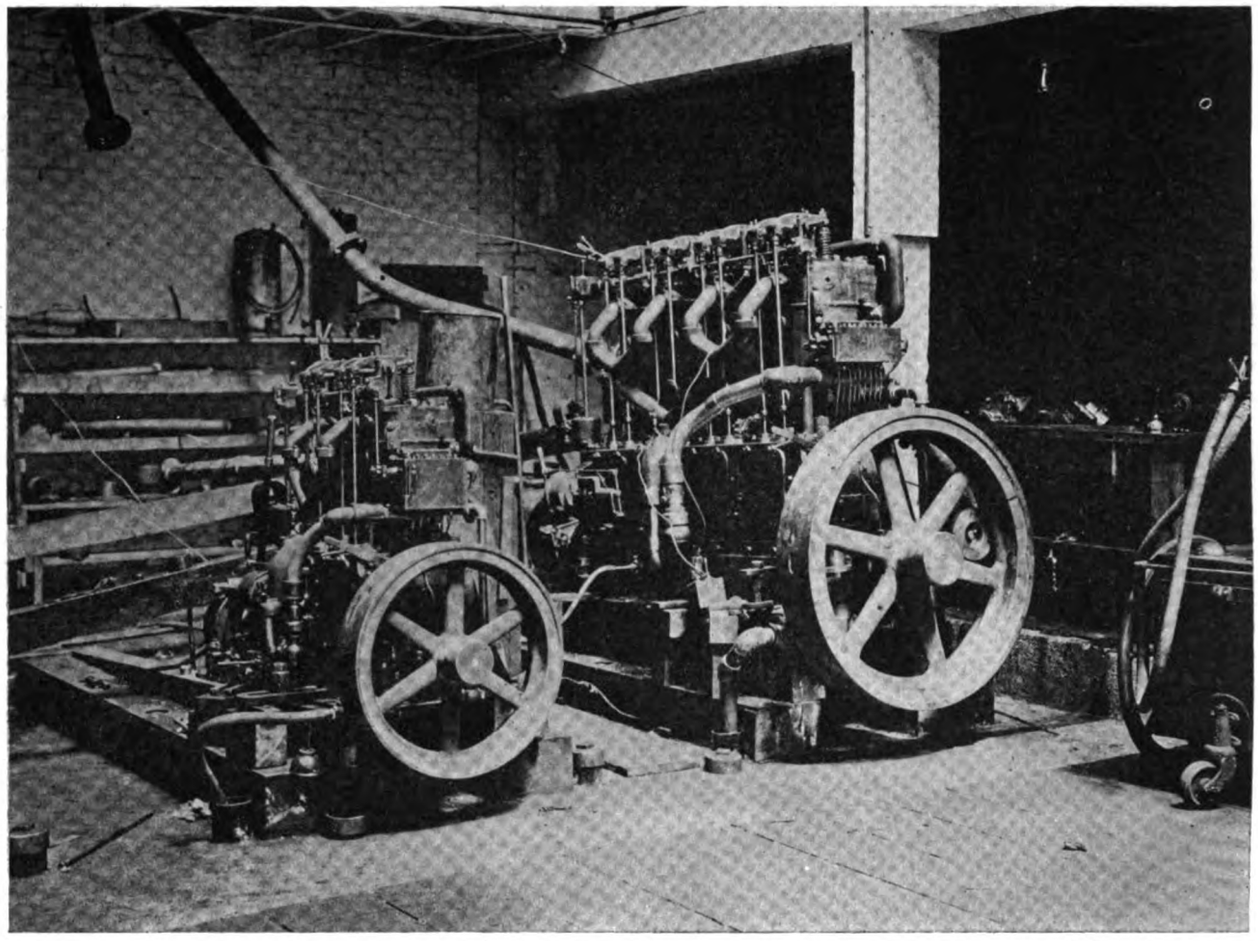

A TWO-CYLINDER 16-HP. AND A FOUR-CYLINDER 85-HP. ENGINE ON THE TESTING-BLOCK

manufacture consequently is greater than would be justified for the other type of engine. To keep this cost of manufacture at a minimum, consistent with a high quality of workmanship, every effort has been made to get the maximum advantage from quantity production. Wherever an operation can be expedited by use of special jigs and fixtures, this has been done. On the other hand, the number of different parts required, and consequently the number of special fixtures, has been kept at a minimum by the use of the same part on two or more sizes of engine wherever possible. A description of some of the more interesting of these fixtures and their use will appear in an early issue.

American Shipbuilding Statistics

During the fiscal year ended June 30, 1920, the total shipping built in the United States (including a small tonnage built for foreign owners) and officially numbered by the Bureau of Navigation, Department of Commerce, amounted to 2241 vessels of 3,860,484 gross tons, compared with 2158 vessels of 3,734,741 gross tons during the preceding fiscal year. The maximum production was reached during the latter part of 1919, when it averaged 350,000 gross tons per month for several months. The present rate is about 225,000 gross tons per month of steel ships. The output of sea-going wood ships has shrunk to the almost negligible total of less than 100,000 tons for the whole of the first six months of 1920.

Tool-Steel From De-Tinned Scrap Stands Up Well

The Electric Furnace Construction Co., of Philadelphia, has been advised that the department of applied science, University of Sheffield, England, recently tested tool-steel made from de-tinned scrap in a Greaves-Etchells furnace with high-grade crucible tool-steel made from Swedish base. The two steels were tested on a mild-steel bar by means of the speed-increment test in which the starting-speed was 20 ft. per minute and the speed-increment 1 ft. per minute. The depth of the cut was $\frac{1}{8}$ in. and the feed per revolution 1/60 in. Each tool was tested three times and there was but little difference between the two steels from the standpoint of durability and cutting power, and each is a good average plain-carbon tool-steel.

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Aluminum-Plate Patterns

By WALTON F. AVERY

The patternmaker by knowledge gained in his work and from experiences of other men, forms in his mind types of patterns for the different methods of molding. Of the many designs placed before him, he determines the best way to mold a pattern being guided by the requirements of quantity, cost, and permanence of the order. If a large number of castings are to be made, it is best policy to avoid the use of cores when possible.

Where manufacturers have certain castings that are

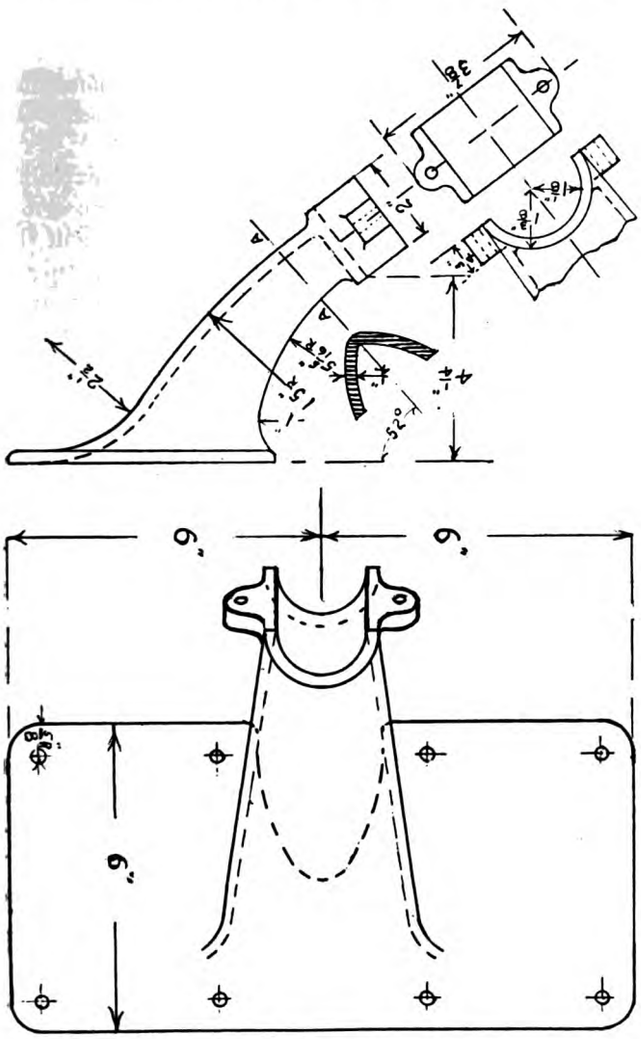

FIG. 1 AND 2. BRACKET DESIGN

not subject to change but are permanent orders from year to year, study of methods of molding and style of patterns is advisable, since such study frequently makes important economies possible. This bracket design in Fig. 1 and 2, showing thin even metal throughout, has been made with and without a core, the latter method requiring a follow-board or sand match; in view of the permanence of the order for castings, however, the patternmaker advised the use of an aluminum plate in a snap-flask.

Fig. 3 and 4 show a section and a half-plan of the pattern in the plate for a 14 by 16-in. snap-flask, the weight of the plate being 10½ lb. The foundryman will note the low parting-line, by which the use of soldiers is avoided. Because of the use of the plate-pattern the casting is produced without any fins and with a smooth surface, which is appreciated by the machinist when he bolts the bracket to other metal. Designs varying considerably but having

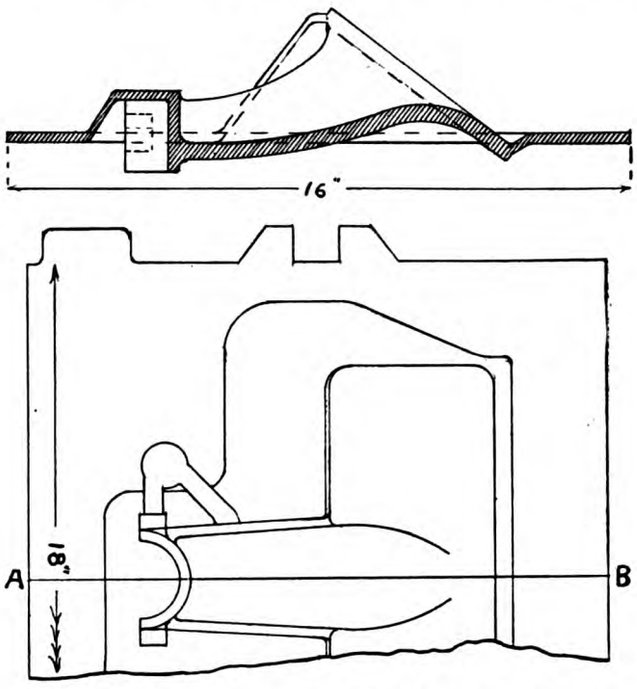

FIG. 3 AND 4. SECTION AND HALF-PLAN FOR PATTERN

an even thickness of metal could be put into a plate-pattern in a similar manner and as satisfactory production in the foundry secured.

HE had been dining well, but not too wisely, and as he was staggering homeward a friend met him and suggested that perhaps it would be better if he were to sit quietly in a picture-show for a time.

They accordingly went in together, but in a little while the friend found the inebriated one sobbing quietly to himself, although the picture flickering across the screen was certainly not a pathetic one.

"What's the matter?" he hissed. "Why can't you sit quiet and look at the picture?"

" 'Sno good, ol' man," sobbed the other. I've gone stone-deaf. I can't hear a single word they are saying."

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Cutting Cast-Iron With Oxygen*

By STUART PLUMLEY and F. J. NAPOLITAN†

More than a year ago, there were rumors heard in the industry, of some genius, who stated that he had cut, or could cut cast-iron. These rumors were not given much credence because it was thought that in most instances the man who believed he had cut cast-iron, had, in reality, cut something else which he thought was cast-iron.

When we succeeded in cutting cast-iron, it much disturbed our dignity in that we were obliged to reverse our former opinions and beliefs, and to take back the statement often made, that cast-iron could not be cut with the oxy-acetylene torch. Unfortunately, our experiments are by no means concluded, so that we are not free to disclose all that we would desire. Frankly, our investigation of cast-iron cutting was inspired by nothing more noble than to seek a better explanation of why cast-iron could not be cut. Most of us have expressed, at some time or other in our experience, the solemn opinion that cast-iron could not be cut, because the oxide of iron melted at a temperature higher than cast-iron itself. Not only does cast-iron burn to form an oxide, but the higher melting-point of the oxide probably assists the reaction.

While we are rather skeptical of the commercial value of a cast-iron cutting-torch, and are convinced that, financially, we will never be repaid for the expense of our experiments, yet there are undoubtedly occasions when the cutting of cast-iron would be of great value. In the ordinary scrap-yard, or in instances where the cutting process would be used as with steel, it is so easy to break cast-iron, that it would hardly be economic to use the cutting-torch. You are all aware of that application of oxygen cutting used largely in blast-furnace practice, the opening of a 'frozen' tap-hole. It is impossible to reconcile this with the pet theory that cast-iron cannot be cut.

There are many instances where the cutting-torch could be used on cast-iron with advantage.

One of the usual methods for releasing a frozen tap-hole in a blast-furnace is substantially as follows: A piece of one-quarter-inch iron pipe with a brass handle, at least ten feet long, is attached to a manifold of several oxygen cylinders. Oxygen is delivered through this pipe at a pressure of approximately 100 lb. per square inch. A hole is driven with a star-drill or diamond-point, until it is about three inches deep. The metal adjacent to the hole is heated with a fuel-oil burner or by other means. The end of the iron pipe is ignited and the composite stream of molten iron slag and oxygen caused to impinge against the frozen cast-iron.

A spectator to this performance of infernal fury is readily convinced that the heat is not all due to the combustion of the wrought-iron pipe, but that the cast-iron is burning with a violence equal to that of steel. This reaction inspired some inventors to incorporate a device in an oxy-acetylene torch for cutting cast-iron that would feed a steel wire between the cutting-jet and the cast-iron piece being cut. Ignition of the wire carried a stream of molten slag on to the cast-iron and it was hoped thus to propagate the cut. In a second process, a plate of steel, of a definite and predetermined thickness, was placed on top of the cast-iron. It was hoped that the slag incidental to the oxidation of the steel would exercise some influence over the cast-iron and enable it to be cut.

Unfortunately for those responsible for the exploitation of these devices, the inventors were more concerned with converting cast-iron into iron oxide by means of the oxy-acetylene torch, than they were in constructing a practical process and a practical tool. It was next proposed to simplify the reaction by supplying an apparatus with a mixture of pulverized slag and iron powder, and in fact a number of patents were issued covering various applications of such a device. Crude and elementary as such devices were, they actually produced combustion of the cast-iron and went a long way in stimulating us in our endeavors to find a successful method.

Experimental work was continued with a torch having several tubes leading to the head so that almost any combination of gases at varied pressures might be obtained. Mr. Napolitan has evolved, from these experiments, interesting theories pertaining to the reactions which take place in cutting, together with their relation to our success in cutting cast-iron. He has noted these theories in a separate paper which is attached herewith. We are presenting these theories to the members of the Society for what they are worth. We can actually cut cast-iron and we do it by preheating the oxygen.

Cast-iron can be cut. It is done by preheating the oxygen.

THE motorist gazed sadly at the wreck of his car, which had skidded into a telegraph-pole. A friend came by and inquired: "Have an accident?"

"No, thanks," replied the unfortunate, "I've just had one."

OWNER—"Hey, Bill, why did you fire that machinist we hired this morning for the milling machine?"

Bill (foreman)—"He was in the way of the machine, it will make us more money without him than with him."

*From a paper presented at a meeting of the American Welding Society.

†Engineering and Research Department, Davis-Bournonville Company.

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Metallography of Iron and Steel as Related to Cutting With Oxygen

By F. J. NAPOLITAN*

From the ease with which wrought-iron is cut, we may conclude that an aggregate of ferrite combines with oxygen with greatest avidity, and permits making the cut with least interruption. As the carbon content is increased, there is a material change in the nature of the metal. In place of the preponderance of ferrite grains, we recognize the formation of cementite, and its union with some of the ferrite to form pearlite—the original mass of pro-eutectoid ferrite rapidly diminishing in prominence. As we should anticipate from the nature of pearlite, no material change is noticed in the performance of these alloys under the cutting torch. A precise consumption test would probably indicate a lowering of the efficiency coefficient, but from all appearances, no unusual difficulty is experienced in cutting carbon steels up to 80 to 90 point carbon. But here, a definite transition is indicated by a distinct laboring of the cutting-torch. While the torch will begin a cut with practically the same effort, and proceeds to completion without interruption or unusual delay, yet the kerf is wide and ragged and undeniably different from that of a mild-steel cut. It is recognized practice, now, to preheat the piece to be cut, to a black or dull-red heat, when the impediment, whatever it was, seems to have been entirely eliminated.

Not much difficulty is experienced in cutting carbon steels up to 80 to 90 point carbon.

But let metallography explain the sudden change of properties of the steel. As the carbon content of the hyper-eutectic steel was increased, the proximate mass of pearlite increased, and the pro-eutectoid ferrite correspondingly diminished in volume, until eventually, a point was reached where all of the cementite and ferrite existed in the stratified or laminated relationship of pearlite. This state is recognized as existing where the carbon content is between 80 and 90 point—the approximate analysis of pearlite is yet undefined. As the carbon content is further increased, there appears a constituent that we know as pro-eutectoid cementite—in fancy, the cementite which has been ejected from the pearlite growth. It is circumstantial that the presence of this pro-eutectoid cementite is directly responsible for the increasing difficulty of our cutting. But why did preheating of the steel before cutting make such a remarkable difference in the results? To be sure, the rise in temperature might affect the stability of any martensite, troostite, or even sorbite that might have existed, but the temperature was too far removed from the Ac_{321} point to affect the characteristics of the pearlite. And surely the pro-eutectoid cementite was unchanged—and it was this same constituent that we blamed for the difficulty.

Again, as the carbon content is substantially increased, a corresponding increase in interference with cutting is apparent, until, when the carbon content approaches 2.5%, cutting becomes so labored as practically to cease, and no amount of preheating short of incipient fusion will permit its being done. As you are aware, the metal is now termed 'cast-iron', and analysis shows in addition to a certain amount of pearlite and pro-eutectoid cementite, as well as certain foreign and, to our discussion, unobtrusive substances, the presence of the final and most stable state of carbon, namely, graphite. The pearlite constituent exercises a favorable influence upon the operation of cutting, and the pro-eutectoid cementite, while it impedes cutting, is readily compensated by a slight preheating, but the graphite presents an entirely new problem.

When the carbon content approaches 2.5%, cutting becomes so labored as practically to cease, and no amount of preheating will permit its being done.

We might digress from the subject enough to present some remarks that would prove the fallacy of at least one of the stereotyped explanations of why cast-iron cannot be cut—that the melting-point of the slag is appreciably higher than the melting-point of cast-iron. A micro-analysis of the structure of an average cast-iron—and by average we refer to a gray cast-iron of 3 to 4% carbon—would indicate a structure identical with that of a hypothetical steel of the same carbon content, except that some of the carbon seems to have been precipitated as graphite. But should that identical pour of cast-iron have been cast against a cold iron mold, or otherwise chilled, the carbon would not have been precipitated as graphite and we should have had what we shall call a 'chilled cast-iron', or a 'white cast-iron'—and it would actually have been a hyper-eutectic steel. Such alloys are not uncommon in commerce, and the fact that operators have been able to cut them with no extraordinary effort, has been responsible for innumerable false claims that cast-iron has been cut. Unfortunately, the nomenclature of steels and irons is not clearly defined, and, undoubtedly, a chilled cast-iron is but an extension of the hyper-eutectic series. The melting-point of an iron-carbon alloy is a constant of its composition, whether, in the solid state, the metal exists as a typical cast-iron or as a steel. Long before the point of fusion, the carbon and the iron exist in one relationship, that of austenite. The condi-

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tions affecting the pouring of a melt of cast-iron would determine the final state of its constituents—and we might as readily produce a gray or a chilled white iron—the carbon as graphite or the carbon as in cementite. In either event, the melting-points of the resulting products would be identical. We agree that chilled cast-iron can be cut with comparative ease, notwithstanding that its melting-point is lower than the melting-point of the slag produced. It is evident, then, that the melting-point of slag is not responsible for the difficulty in cutting cast-iron.

Chilled cast-iron can be cut with comparative ease, notwithstanding the fact that its melting-point is lower than the melting-point of the slag produced.

We had concluded that while the existence of pro-eutectoid cementite appreciably retarded cutting, the presence of but a comparatively small amount of graphite completely prevented cutting. The phenomenon, if it were true, is unique, for it would pre-suppose the incombustibility of carbon. Science contradicts us immediately. In fact, our own welding practice belies us. We might point to the reaction accompanying the removal of carbon from automotive cylinders by the oxygen method—or, leaving our immediate field, we might mention the explosive combustion of carbon in ordinary gun-powder. We are forced to conclude then, that far from retarding the combustion of the steel matrix, the graphite of cast-iron should actually assist it.

We investigated further to determine how much graphite influenced cutting. We obtained specimens of so-called malleable castings of the characteristic 'black-heart' structure. Such a structure is made in this country by the annealing of white cast-iron in which all of the carbon exists in cementite or pearlite, the latter in some cases entirely removed. The treatment decomposes the cementite to precipitate the carbon in minute particles, differing from the graphite of gray cast-iron in their extreme subdivision and uniform distribution throughout a ferrite matrix. In making a black-heart casting, an oxidizing packing is used in this country so that, while the core is that of a black-heart casting, the mass near to the surfaces is ferrite. We removed this shell of ferrite so that our materials indicated, under the microscope, a uniform aggregate of ferrite and temper carbon. By preheating this piece to a dull red heat, it was cut with the characteristics of a high-carbon steel. Then we were satisfied that carbon as such did not prevent cutting, but that the physical state of that carbon was responsible. When it existed as plates of graphite, cutting was prevented—but when present as finely divided particles, cutting was scarcely impeded.

When carbon exists as finely divided particles, cutting is scarcely impeded, but when present as plates of graphite, cutting is prevented.

Reconsidering our previous observations in the light of this development, we began to substantiate our first logical hypothesis. We found, to summarize, that ferrite could most readily be cut. Pearlite with pro-eutectoid ferrite did not materially affect the condition. A completely eutectic composition first suggested a transitional stage. The existence of pro-eutectoid cementite retarded cutting; but preheating of the piece to a red heat readjusted the conditions so that cutting was again as efficient as in the case of ferrite. As the comparatively low temperature produced by preheating was insufficient to effect any change in the physical state of the constituents of the alloy, we were forced to conclude that the addition of heat units affected a definite constant, which we assumed was the heat of combustion of the iron, as the two forces were of like characteristics. Then a constant result from a variable, made axiomatic the existence of a second variable. Our second variable, then, we concluded, was the cooling effect of the stream of cutting oxygen, and a further thought suggested a third variable in the time of chemical reaction between the iron and oxygen. The preheating flames ignited the steel—the cutting oxygen produced combustion—and the propagation of the cut was a natural consequence. But as the carbon content was increased the speed of the reaction was materially lowered; however, the velocity of cutting oxygen to ensure a continuity of oxygen and slag to the bottom of the cut, was a constant. Then, eventually, a point was reached where the rate of combustion between the iron and oxygen was so slow that the heat units liberated from the reaction were dissipated to such an extent as no longer to ignite adjacent masses of metal—and cutting ceased. By preheating the piece before cutting, we add to the forces on the weakening side of the equilibrium, and cutting once more obtained. The heat units so obtained compensated for the relatively less heat units liberated from the chemical combination of the iron and oxygen in a definite unit of time.

While the pearlite and pro-eutectoid cementite are readily compensated, the graphite carbon effectively prevents cutting by the ordinary means. No addition of heat units short of incipient fusion, by preheating the object, restores the equilibrium. We cannot strengthen further one side of our equilibrium, but we have not attempted to affect the other side. We have made no attempt to reduce the cooling effect of the cutting oxygen. We therefore experimented in this direction, and found that we could so effectively preheat the cutting oxygen that we could restore the equilibrium without preheating the object.

Cast-iron can be cut by preheating the oxygen.

ONE of the Texas friends of Congressman Cooper met him the other day.

"You smoke, don't you?" he asked.

"Sometimes," said Cooper.

"Take this," remarked the Texan. "This is something like a cigar."

Cooper took the weed, lighted it, and puffed three or four times. "Yes," he assented, "this is something like a cigar. What is it?"

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Apprentice School of the Sacramento Shops of the Southern Pacific Company

The Southern Pacific Co. was among the first to recognize the importance of industrial training and the need for classroom instruction to supplement the training received by the apprentice in the shop itself. The first apprentice school on the system was established at Oakland in 1912, which was followed by schools at Sacramento, Roseville, Sparks, Ogden, and Dunsmuir. The schools are all run on the same general plan, and in accordance with agreements between the company and the unions representing the crafts interested.

Applicants for apprenticeship must not be under 16 years old nor over 22. Minors must have the consent of parents or guardians. Before being enrolled, apprentices are given a general examination corresponding approximately to completion of the seventh grade. However, no special passing-mark is established. If a boy whose opportunities for schooling have been limited, and who makes a favorable showing in other ways, happens to show up poorly on examination, this fact will not necessarily bar him. In general, the boys in the apprenticeship are sons or near relatives of company employees, whether working in the shops or in other departments. Naturally, practically all the apprentices are residents of Sacramento and live at home with their parents or guardians.

The first six months of the boy's apprenticeship is classed as a probationary period, during which a boy's fitness for his chosen work is determined. His progress is carefully watched by the foreman and instructors, and if, at the end of the period, it appears that he does not possess the qualifications of a good mechanic, he and his parents are so informed and he is given the opportunity to withdraw.

The term of apprenticeship is four years. The entrance rate of pay is 29 cents per hour, which is increased 2½ cents per hour at the end of each six months period, except the last two periods, when the increase is 5 and 7½ cents respectively. Upon completion of their apprenticeship, apprentices are paid the regular journeymen's wages.

The rules also provide that modifications of the various foregoing regulations may be made in the cases of apprentices that have served part of their time elsewhere and for those that have received special training in some technical institution.

The school at the Sacramento shops is the largest on the Southern Pacific system. It was started in 1913 and now numbers 250 apprentices. It is also the second largest on any railroad system in the country, and the largest under one instructor, R. P. Peek, who is a journeyman pattern-maker himself, and who received his training at the school.

Each boy spends four hours a week, on the company's time, in 2 two-hour periods in the class-room, classes continuing throughout the year, from seven to nine and from ten to twelve in the morning, and from one to three in the afternoon. They come to the class-room in squads of 25, dressed in their working clothes, and with a definite purpose to learn. When the two-hour period is completed, one squad leaves and the boys go into the shops for the rest of the day, and with the opening of another class period another squad comes to the class-room. When a boy enters the school he begins with a thorough review course in mathematics, from simple arithmetic to and including elementary algebra and geometry. The rest of his school work is mainly devoted to drawing and design along the lines of the particular trade he has selected, special attention being also paid to safety instruction.

The schedule of shop training for the different trades is as follows:

MACHINISTS

First two years on machines.

Third year on erecting floor.

Fourth year on erecting floor or on machines, according to the qualifications of the apprentice.

At the conclusion of the second year, apprentices so inclined may, with the consent of the apprentice board, be assigned to air-brake work, or toolmaking, for the remaining two years of the apprenticeship.

Detailed Schedule of Work

Machine Work

Small lathe	3	months
Large lathe	3	"
Turret-lathe	2	"
Planer	3	"
Shaper (crank)	2	"
Shaper (draw-cut)	2	"
Milling machine	3	"
Boring mill	3	"
Drill-press	1	"
Slotter	2	"
	24	"

Erecting-Floor Work

Valves (including all work pertaining to valves)	6	months
Shoes and wedges	3	"
Frames	2	"
Cylinders	2	"
Cab-work	2	"
Spring rigging	2	"
Brake rigging	2	"
Boiler fittings	2	"
Injectors and lubricators	1	"
Guides	2	"
	24	"

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BOILERMAKERS

Heating rivets	1	month
Tool-room	1	"
Sheet-metal working	3	"
Bracing boilers	6	"
Tank-shop	3	"
General riveting	3	"
Chipping and calking	3	"
Flange turning	3	"
Fitting up	6	"
Erecting shop (general repair work)	10	"
Roundhouse and running repair work	3	"
Laying-out bench	6	"
	48	"

BLACKSMITHS

Helping (small fire)	6	months
Small fire (without helper)	6	"
Car-forgings, blacksmith-tools, etc	12	"
Locomotive work of medium weight and machine-shop tools	12	"
Average grade of work in shop, including heating and forging of heavy material	12	"
	48	"

SPRING-MAKERS

Heating ends of steel	6	"
Helping on band-fire	6	"
Helping on welding-fire	6	"
Helping on spring-furnace	6	"
Light blacksmith work	12	"
Spring-maker	12	"
	48	"

MOLDERS (General Foundry)

Core-room	12	months
Helping molder at loam-work	6	"
Dry-sand work, locomotive-cylinders	6	"
General floor-work	12	"
Green-sand molding	6	"
General all-round work	6	"
	48	"

MOLDERS (Brass Foundry)

Core-room	6	months
Third-class work	12	"
Second-class work	12	"
First-class work	18	"
	48	"

COPPERSMITHS, TINSMITHS, AND PIPERS

(Locomotive Department)

Helping mechanic (piping work and tool-room	2	months
Locomotive-boiler and engine piping	6	"
Locomotive air-piping	9	"
Car piping (water, gas, steam, and air) 1 mo. each	4	"
All classes piping, general, stationary, and air	3	"
Locomotive copper work (piping, gaskets, etc.)	6	"
Helping mechanic (general tinsmith work)	2	"
Working at bench with mechanic (tinsmith work)	4	"
Working at bench alone (tinsmith work)	4	"
Car (copper and tinsmith work)	4	"
General floor-work (copper and tinsmith work)	4	"
	48	"

ELECTRICIANS

Helping electrician around shop	6	months
Car-wiring and wiring repairs	12	"
Wiring building and car-wiring installation	12	"
With electrician on axle lighting equipment	6	"
Locomotive wiring	6	"
With electrician on motor repairs and installation	6	"
	48	"

PATTERN-MAKERS

Caring for machinery, making dowel pins, planing wooden fillets, making glue, keeping material in order, helping mechanics at machines	6	months
Simple lathe work, sandpapering, varnishing patterns, helping mechanics by jointing and gluing up stock	6	"
Helping molder in general foundry	9	"
Working with mechanic on general work in pattern shop	15	"
Working alone on general work	12	"
	48	"

CABINET-MAKERS

Helping machine hands	3	months
Light common work at bench	6	"
Office furniture, etc	9	"
Getting out material in mill	6	"
In car-shop as car-builder	6	"
In cabinet-shop on general work	6	"
In car-shop on inside finish	6	"
In cabinet-shop on general work	6	"
	48	"

CAR-BUILDERS

Common work around cars, such as repairing fish-racks, underlining, floors, etc	12	months
With mechanic on such work as side-door steps, baggage-car siding, roofing, and inside lining	6	"
Platforms	6	"
Passenger-car sheathing, framing on cars, on steel work, placing underframes	6	"
Sheathing, dressing, and surfacing	6	"
General car-building	6	"
Laying out steel work and placing steel underframes	6	"
	48	"

COPPERSMITHS, TINSMITHS AND PIPERS

(Car Department)

Helping mechanic (piping work and tool-room	2	months
Water system, cars	3	"
Gas system, cars	3	"
Steam system, cars	4	"
Air system (including test rack)	6	"
Locomotive-boiler and engine piping	2	"
Locomotive-air piping	4	"
Locomotive copper-work (piping, gaskets, etc.)	6	"
Helping mechanic (general tinsmith work)	2	"
Working at bench with mechanic (tinsmith work)	2	"
Working at bench alone (tinsmith work)	4	"
Dining-car work	6	"
General jobbing work on cars and in shop	4	"
	48	"

UPHOLSTERING

Sewing-machine work	12	months
Upholstering arm-rests, back rests for locomotives, cushions, replacing springs	12	"
Making window-curtains and applying fixtures complete, upholstering car-seats and dining-car chairs, making mattresses	12	"
General upholstery work	12	"
	48	"

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CAR PAINTERS

Stock-room	6	months
Rough painting	6	"
Painting, filling inside of cars, staining, shellacing, varnishing, rubbing, and polishing	12	"
Outside of cars, priming, puttying, sand-papering, coloring, cutting-in, varnishing, and lettering	12	"
General work of all kinds	12	"
	48	"

The rules provide that boys employed as apprentices must not be used as messengers or office-boys, but must assume their duties in the shop upon being employed, and further that the practice of using apprentices as helpers or sweepers (on non-instructive work) shall be avoided to the fullest extent possible. In other words, apprenticeship in these shops is a real apprenticeship. A boy is not simply 'exposed' to a trade in the hope that he will catch it, but he is thoroughly inoculated with it, and it is his own fault if it does not 'take'. Part of Mr. Peek's duties, in addition to giving individual instruction and guidance to the 250 apprentices, is to keep accurate check on the work in the shops, to see that the boys are getting the right kind of training from the foremen, and to confer with both the foremen and the boys regarding the latter's progress.

So much for the school and its methods. What have been the results? First, about 80% of those that complete their apprenticeship enter the service of the company. This is, of course, a relatively small proportion of the total number of men hired at the shops, but it must be remembered that many of those hired at the gate remain at work for only a few days or weeks, while the apprentice-school graduates are nearly all permanent employees. In fact, during the war period, when the roving mechanics had nearly all of them gone elsewhere, apprentice-school graduates formed the nucleus without which it would have been almost impossible to keep the work going at all. One provision of the rules is of interest in this connection. It states that wherever possible, holders of certificates showing satisfactory completion of the term of apprenticeship shall be given preference in matters of employment. Of course, this is an excellent rule to have in the book, but thus far, experience has shown it to be hardly necessary, since the foremen all prefer apprentice-school graduates anyway. In spite of the relatively short time since the establishment of the school, several of its graduates have been advanced to foremanships or other positions of authority, while, as already noted, the present head of the school is himself one of the graduates.

It is interesting to note that in general the attitude of labor officials has been one of cordial co-operation with the work and purposes of the company in its apprentice training. The training of apprentices is in accordance with agreements with the unions affected, and certain restrictions, such as the rule of one apprentice to five journeymen in a shop are included in the agreement, but the main desire of the labor men seems to be to see that the boys get all the opportunity possible to learn their various trades.

Canada's Foundry and Machine-Shop Products

The Dominion Bureau of Statistics has now made public the results of its survey of the production in foundries and machine-shops in Canada during 1918. Its report covers 667 plants—369 in Ontario, 126 in Quebec, 69 in British Columbia, 25 in Saskatchewan, 23 in Nova Scotia, 23 in Manitoba, 15 in Alberta, 13 in New Brunswick, and 4 in Prince Edward Island.

The total capital invested in the industry in 1918 was $84,122,446. Ontario leads with a capital investment of $56,880,631, Quebec is second with a total of $14,276,674, British Columbia third with $3,635,563, and then follow Manitoba with $2,781,536, New Brunswick with $2,623,056, Nova Scotia with $2,007,191, Alberta with $1,176,932, Saskatchewan with $508,423, and Prince Edward Island with $232,440.

The cost value at the works of the materials used and the selling value at the works of the products made during the year were:

Materials Used	Cost value at works
Pig and scrap-iron	$9,100,807
Bar and sheet-iron	612,335
Black and galvanized-iron	759,780
Malleable and wrought-iron	275,503
Iron castings purchased	1,289,892
Sheet, plate, and tool-steels	1,929,016
Steel bars, billets, and other shapes	3,636,480
Steel castings, purchased	299,442
Brass castings, purchased	307,978
Brass sheets and bars	312,697
Bronze castings	214,874
Tin, sheet and pig	269,557
Copper, bar, sheet, pig, etc	255,924
Other metals	609,211
All other miscellaneous materials	7,914,563
Total	$27,788,059

Products	Selling value at works
Gray and malleable-iron castings	$12,588,988
Brass and copper castings	856,633
All other castings, not specified	904,750
Stoves (oil, coal, gas, electric, and wood)	6,024,473
Furnaces, hot-air	1,117,832
Ventilating appliances	324,511
Furnaces, hot-water, etc	702,926
Radiators and parts	1,536,073
Stove and furnace parts	717,980
Grate-bars	158,456
Hot-air registers and grills	111,037
Machinery of all kinds	8,066,455
Tools of all kinds	1,536,267
Tinware	1,496,115
Munitions	7,703,838
Boilers and engines	3,660,168
Car-wheels	2,028,975
Foundry supplies	4,140,796
Miscellaneous products	21,020,892
Custom-work and machinery repairs	7,796,732
Total	$82,493,897

PAT was employed as a hodcarrier during the new building operations. One morning he happened to be late. Putting on his clothes in haste he hurried away without noticing that he had put on his overalls hind side to. Arriving at the works just in time, he was soon climbing the ladder with his first hod of brick, but half way up he fell to the ground.

His mates rushed to the rescue. "Are you hurt?"

Pat opened his eyes and for a moment gazed wonderingly at his own legs. "No, bedad," he said, "but I've had a terrible twist."

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The Works-Council System at the Shipyard of the Union Construction Company

When the members of the California Metal Trades Association re-opened their plants last November on the open-shop basis, they recognized, in their statement of policy, the right of their employees to organize into some form of organization by which the employees in a plant could put forward their desires and protect their interests. In accordance with this statement of policy, the Union Construction Co., as well as most of the other large plants, announced early in January a tentative plan for representation and organization.

The preliminary steps were described in detail in 'Metal Trades' for February and the principal features of the tentative plan were the same as for the other yards. The men in the yard chose, at an election by secret ballot, five men from among twenty-five journeymen mechanics nominated by the company. The 25 men nominated were divided into groups of five, representing the five main departments of the plant, so that each department was represented by one of those elected. The five men elected, together with five foremen named by the company, form the works committee over which the Service Manager presides, without a vote. The works committee so chosen then appointed a craft representative for each of the crafts employed in the yard. The works committee was also charged with the work of preparing a permanent constitution, which has been done, and the constitution adopted.

The general features of the plan finally adopted resemble those of the temporary plan. Any matter not covered by the policy and shop rules under which the yard is working (those adopted by the California Metal Trades Association last November) may be adjusted through the agency of the works committee. Any employee has the right to take up without prejudice to himself and under the prescribed method any grievance, adjustment, or suggestion that is in order as already provided. This may be done either directly or through the employee's craft representative. Any question involving a grievance or adjustment should first be taken up with the leading-man or quarter-man. If a satisfactory adjustment cannot be reached, the matter is referred successively to the foreman and the department head. If a satisfactory conclusion cannot be reached in this manner, the facts are presented to the Service Manager, who either effects an adjustment, or places the matter in writing before the works committee whose decision is binding. Suggestions and other matters not in the nature of a grievance or adjustment are referred either to the foreman or to the works committee.

Craft representatives are, as already noted, appointed, one from each craft, by the works committee. Leading-men, quarter-men, and foremen are not eligible as craft representatives. Craft representatives hold office at the pleasure of the works committee. On written request signed by 25% of the members of his craft, a craft representative must be removed, and a new representative appointed. A craft representative takes up matters as already outlined, either upon request of any member of his particular craft or upon his own initiative, and also co-operates in general with the works committee. A foreman must not refuse to deal with a craft representative from any craft working under his supervision, provided that the representative is acting in accordance with the constitution and by-laws and the rules of procedure. No craft representative shall suffer in any way because he is compelled in his representative capacity to differ with or to appeal from any foreman or representative of the company, neither does his position as craft representative shield him from discipline for his own personal mistakes and inefficiency.

The works committee meets once a week on the company's time. Once a month, a joint meeting of the works committee and craft representatives is held. Craft representatives may also attend the weekly meetings, and any representative who has charge of some special matter to come before the works committee does so, in any event.

The principal matters with which a works-council organization is concerned may be divided into three general classes, namely, wages and working conditions, grievances and minor industrial relations, and special activities, such as athletics, entertainments, etc. With the first class of questions, the works committee at the Union yard, like the works committees in the other yards, has had little to do. Wages and, to a considerable extent, working conditions have been fixed until October 1 by the announcement made when the yards and shops reopened, and the men by going to work accepted these conditions. Some men in the yards who expected that the adoption of the works-council plan was going to provide them with the machinery for getting a raise in pay whenever they wanted it, were disappointed when they realized the actual conditions, but the great majority of employees took a reasonable view of the situation.

Grievances reaching the works committee have been relatively few. About the only important case was that of a chronic 'kicker', who preferred charges against his foreman. The works committee made a thorough investigation and sustained the foreman by a unanimous vote, in this as in other ways bearing out the observation so frequently made in connection with plans for employee representation, namely, that the men chosen as representatives feel their responsibility, and lean, if anything, toward the conservative attitude.

The Yard has a baseball team and a bowling team, in

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both of which considerable interest is taken. The committee also arranged a Yard theatre-party last spring, buying out the entire house at a local theatre, and in this way clearing over $400 for its general fund. With athletic and similar activities, however, the committee has merely tried to find out the wishes of the general run of the employees and to co-operate with them, rather than to attempt to stimulate a lot of 'hot-house' enthusiasm.

Study of the minutes of the committee since its organization shows that in addition to the preparation of a permanent constitution, the following subjects were among those coming up for discussion: improvement of street-car service, participation in various athletic contests, improvement of telephone service, permitting political speakers to address the workmen, and exclusion of peddlers and solicitors from the Yard.

The reader that has been expecting to hear that the works council plan has already brought in the industrial millenium may feel disappointed after perusing this article, and may think that the relatively elaborate machinery provided is not accomplishing very much. It is probably true that most, if not all, of the matters coming before the works committee at the Union yard could have been handled just as well and with considerably less effort directly by the company's efficient Service Department, but, on the other hand, the men themselves would not have been so well satisfied as when everything was done by their own representatives. The works-council organization has not accomplished wonders, but it is obtaining the confidence of both the employees and the management. The attitude of the general run of the employees toward the organization might be said to be similar to that of the average citizen toward the police department of his community, not greatly concerned with it or its methods of working, but nevertheless very glad that it is there. Those most interested in the works-council organization have not attempted to give it undue prominence, but have been content to let it work into a field of usefulness and to become an integral and necessary part of the Yard itself. Apparently they are succeeding.

THE total lack of comprehension between the American negro and his Algerian brother will go down in history as one of the outstanding features of the War.

There was, for instance, the case of the dusky stevedore at Brest and one of the colored French troops on duty there. Long and laboriously the Yank tried to establish some means of linguistic communication, but there was no response.

Then a brillian thought struck the boy from Georgia. He produced a pair of ivory cubes and rolled them enticingly under the Algerian's nose. Intelligence still registered zero.

"Man," said Sam in disgust. "You ain't no cullud pusson. You ain't even no human. You is just a corpse."
—'The American Legion Weekly.'

A Handy Job-Ticket

The illustration shows the job-ticket used in the machine-shop of the Hughson-Bacon Co., of Oakland. The ticket is of ordinary heavy paper. The instructions and other information are written in ink. To protect the

HUGHSON-BACON CO.

JOB No._____

No. of Pieces_____

Name

_____

Part No._____ Jig No._____

Pattern No._____

Date Started_____

Rejected Castings_____

Date Finished_____

Instructions

_____

_____

_____

_____

_____

_____

_____

_____

writing and keep it clear, it is brushed over with ordinary varnish. On the reverse side is pasted a blueprint or else a pencil sketch showing the operation to be performed. The job-ticket goes with the work into the shop, and when the job is completed, is returned to the office for a permanent record.

THEY say that a certain resident of the Bay district passed to his reward a short time ago, and when he came to the pearly gates was stopped by St. Peter with the inquiry. "What good did you do in life that makes you eligible to come in here?" The applicant thought a few minutes and then admitted that he could not remember any. However, the newly-arrived soul looked like a good sport, so St. Peter was loath to turn him down, and he decided to ask a few more questions.

"Where did you come from?"

"San Francisco," was the reply.

"What did you do in life?"

"I was a molder."

"Oh, well. Come in. You won't stay more than a few days anyway."

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Surface Carburizing*

By G. E. MANSFIELD†

The most satisfactory steel to carburize contains between 0.10 and 0.20% carbon, less than 0.35% manganese, 0.04% phosphorus and sulphur, and low silicon; but steel of this composition does not satisfy our progressive engineers, and many alloy steels are now on the market, which, although difficult to machine, give the various qualities demanded when carburized, such as a hard case, tough core, or both. However, the additional elements also have an effect on the rate of penetration during the carburizing operation, and therefore such alloy steels require careful supervision during the entire heat-treating operation.

According to Guillet, the absorption of carbon is favored by those special elements which exist as double carbides in steel. For example, manganese exists as manganese carbide in combination with the iron carbide. The elements that favor the absorption of carbon are: manganese, tungsten, chromium, and molybdenum; those opposing it, nickel, silicon, and aluminum. Guillet has worked out the effect of the different elements on the rate of penetration in comparison with steel that absorbed carbon at a given temperature, at an average rate of 0.035 in. per hour.

His tables show that the following elements require an increased time of exposure to the carburizing material in order to obtain the same depth of penetration as with simple steel:

When steel contains	Increased time of exposure
2.0% nickel	28%
7.0% "	30%
1.0% titanium	12%
2.0% "	28%
0.5% silicon	50%
1.0% "	80%
2.0% "	122%
5.0% "	No penetration
1.0% aluminum	122%
2.0% "	350%

The following elements seem to assist the rate of penetration of carbon, and the carburizing time may therefore be reduced as follows:

When steel contains	Decreased time of exposure
0.5% manganese	18%
1.0% "	25%
1.0% chromium	10%
2.0% "	18%
0.5% tungsten	0
1.0% "	0
2.0% "	25%
1.0% molybdenum	0
2.0% "	18%

The carbon content of the case generally is governed by the temperature of the carburization. It generally proves advisable to have the case contain between 0.90% and 1.10% carbon; more carbon than this gives rise to excess free cementite or carbide of iron, which is detrimental, causing the case to be brittle and likely to chip.

T. G. Selleck, in the 'Journal' of the American Steel Treaters' Society for September 1919, gives the following table of temperatures and the relative carbon contents of the case of steels carburized between four and six hours, using a good charcoal carburizer.

Table of Carbon Content Obtained at Various Temperatures

	%
At 1500°F., the surface carbon-content will be	0.90
At 1600 " " " " " "	1.00
At 1650 " " " " " "	1.10
At 1700 " " " " " "	1.25
At 1750 " " " " " "	1.40
At 1800 " " " " " "	1.75

To this valuable table, I should like to add the following, which I have used for a number of years. I do not know the name of the author. The table is self-explanatory, giving the penetration of the carbon of the case at different temperatures for different lengths of time:

	Temperature 1550°F.	1650°F.	1800°F.
	Inches		
Penetration after ½ hour	0.008	0.012	0.030
" " 1 "	0.018	0.026	0.045
" " 2 "	0.035	0.048	0.060
" " 3 "	0.045	0.055	0.075
" " 4 "	0.052	0.061	0.092
" " 6 "	0.056	0.075	0.110
" " 8 "	0.062	0.083	0.130

From the tables given we may calculate with a fair degree of certainty the amount of carbon in the case, and its penetration. The facts can be readily checked by an examination of samples with the microscope.

*Extract from 'Journal' of the American Steel Treaters' Society.

†Metallurgist, Wheelock-Lovejoy Co., Cambridge, Massachusetts.

Standardization of Pipe Flanges and Fittings

The American Society of Mechanical Engineers has been requested by the American Engineering Standards Committee to assume sponsorship in the standardization of pipe flanges and fittings. In 1914, the Society issued a report covering a schedule of pipe flanges and fittings, for diameters from 1 in. to 100 in. for 125 lb. pressure, and also a schedule for extra-heavy pipe, covering a range from 1 in. to 48 in. diam., and for 250 lb. pressure. In 1918, a supplementary report was published for working pressures of 50, 800, 1200, and 3000 lb. While the work has not been active during the last year, it will now be continued, the Society being formally recognized as sponsor, under the rules of procedure of the American Engineering Standards Committee.

Standardization of Shafting

The American Engineering Standards Committee has invited the American Society of Mechanical Engineers to act as sponsor for the standardization of shafting. The Society has already done a considerable amount of work on a set of standard diameters for transmission and machinery shafting. It is proposed that the work, which will be carried out by a sectional committee working under the rules of procedure of the American Engineering Standards Committee, shall be broadened to include the standardization of the method of determining what diameters of transmission shafting should be used for given loads, the dimensions of shafting keys and keyways, and the setting of dimensional tolerances.

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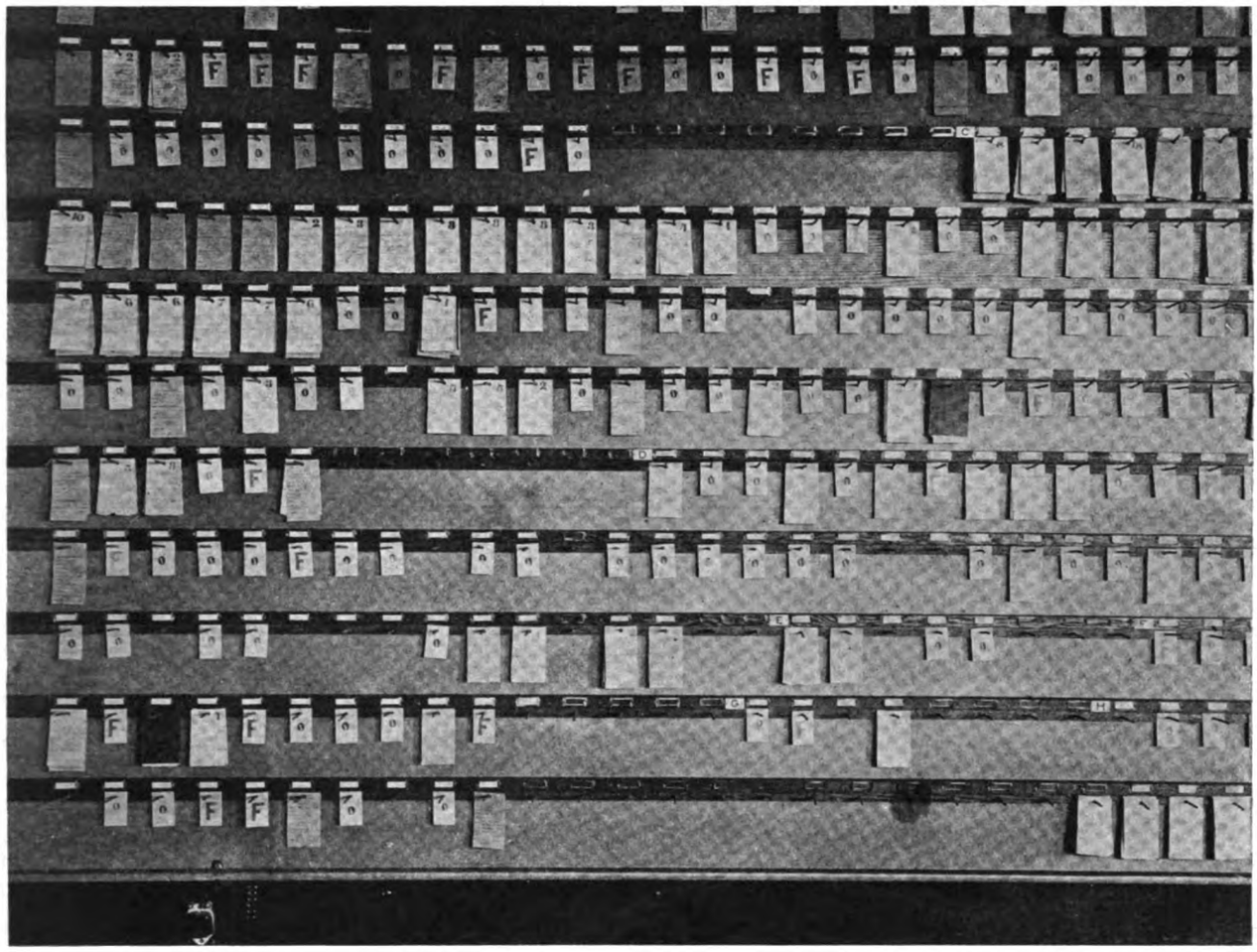

PART OF PRODUCTION BOARD FOR MANUFACTURING DEPARTMENT. A SIMILAR BOARD IS USED FOR THE ASSEMBLY WORK. NOTE THE 'F' AND 'O' CARDS, ALSO THE OPERATION-NUMBERS STAMPED ON THE TIME-CARDS. ABOVE EACH PEG IS THE INDEX-NUMBER FOR THE PARTICULAR PART.

Production Board at Marchant Calculating Machine Company

The Marchant calculating machine requires slightly over 1200 separate parts, 367 of which are different. Furthermore, the machine is made in two sizes, and some of the corresponding parts in the two types differ slightly. The 'production board' described below has been devised with several ends in view, namely, to route the work so that there shall be no delay for lack of parts, to make it possible to determine at any time the present status of any job in the factory, and to permit the checking of costs at any time.

Every part used in the machines is assigned a letter and a number, such as B-2. Each group of small parts in the principal assemblies has the same letter, and, in addition, the parts are numbered 1, 2, 3, etc. Thus B is the general letter for all parts belonging to the carriage and B-2 is the carriage base-plate dowel. On the production board there is a peg for each part, classified by letter and number. Orders are made in triplicate on the form shown in Fig. 1. One copy is retained in the office and one copy goes to the department where the work is to be done. When, as is the case with many of the parts, work on them must be done in two departments, a copy goes to each department. At the same time the materials required are requisitioned from the storeroom on the form shown in Fig. 2, which is made in duplicate, one copy going to the storeroom and the other to the office. A tag of heavy pasteboard with a large O stamped on it is hung on the proper peg on the production board, indicating that an order for the manufacture of this part has been issued and is under way.

Time-cards on the form shown in Fig. 3 are turned in to the office daily and are hung on the proper peg. All operations are standardized so that a reference to the card-index shows exactly what work is represented by

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PRODUCTION ORDER No. 751.

PART No. AND NAME

DATE OF ORDER

QUANTITY TO BE MADE

DATE REQUIRED

REQUISITION No.

INSTRUCTIONS

DATE	QUANTITY DELIVERED STORES	DATE	QUANTITY DELIVERED STORES

FIG. 1. PRODUCTION ORDER. THE ORIGINAL HAS SPACE FOR SEVERAL ENTRIES

the card. For convenience in reference, each card is stamped before being hung on the peg with the number of the operation in large figures. Above and including the line marked 'Foreman's O.K.', the card is filled out in the shop; below that point it is filled out in the office. The record of the material used is kept on the form shown in Fig. 4. For operations in the enameling and plating departments, the form shown in Fig. 5 is used. Printing it on cards of a different color from the others makes it easily distinguishable. When the work is completed, inspected, and delivered to the storeroom, this is recorded on the form shown in Fig. 6, and like the other tags is hung on the proper peg. The work of making the particular part being now completed, a heavy paste-

MATERIAL REQUISITION

Date _____ No.

Storekeeper:

Please deliver to _____

These Materials are required for _____

Insert Use to which Materials will be put, or Order No.:

Requisition Filled Signed

Unit	Quantity	Description	Rate Per Unit	Amount

MATERIAL CARD

ORDER NO. _____

PART NO. _____

QUANTITY ON ORDER _____

REQUISITION NO. _____

MATERIAL KIND _____

SIZE _____

TOTAL QUANTITY ON REQUISITION _____

QUANTITY DELIVERED _____

DATE _____

VALUE _____

STKPR. O.K.

FIG. 4. MATERIAL-CARD

INSPECTION AND STORES REPORT

DATE _____

ORDER NO. _____

PART NO. _____

QUANTITY RECEIVED _____

REJECTED _____

RETURNED _____

REMARKS _____

O.K. INSPECTOR _____

O.K. STOREKEEPER _____

RECEIVED IN STORES _____

FIG. 6. INSPECTION REPORT

ORDER NO. _____

Part No. _____ Date _____

Quantity on Order _____ Quantity in Box _____

Operation	Date Finished

FIG. 7. OFFICE RECORD

DEPARTMENT

_____

ORDER NO. _____

PART NO. _____

OPERATION NO. _____

QUANTITY RECD. _____

DATE _____

FOREMANS O. K. _____

FIG. 5. CARD FOR ENAMELING AND PLATING OPERATIONS

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board tag with an F stamped on it is hung on the peg to indicate this fact.

As the work of making parts frequently overlaps, one order for a given quantity being started before the preceding order is completed, the production board has been constructed in duplicate, with two sets of pegs for the various parts. A similar board and similar sets of tags are used for handling the assembly work. Just like the individual parts, each minor assembly has a letter assigned to it. Thus C-102 may be the assembling of the individual parts C-35, C-45, and C-51. Numbers are given to operations on assembly work, just as they are on manufacturing. When an order is completed, the tags are taken off the board and filed, after being used for computing the final costs.

Fig. 7 shows the form for summarizing the progress on the order, which is filled out in the office.

World Looks to United States for Steel

Upon the United States rests the responsibility of making up the tremendous world-wide shortage of iron and steel caused by the War, says Herbert P. Howell, vice-president of the National Bank of Commerce in New York, in an article on 'The International Market for Iron and Steel' which appears in the July issue of 'Commerce Monthly', that bank's magazine of commerce and finance.

Mr. Howell points out that the quantities of iron and steel used in the making of munitions have left the world with a four years' accumulation of needs for such metals for industrial uses. Great Britain alone of the European producing countries today is capable of competition with this country in supplying this demand.

"The world is short of iron and steel," Mr. Howell says. "The United States, Great Britain, and Germany produce 80% or more of the total iron and steel output of the world, while Belgium is a considerable factor in the international market. The War had varying effects on the industries of these three European countries. The case of Germany is clear. As a producer of iron and steel for the international market, that country need not be considered at present. French production is dependent on German coal, and lack of fuel and industrial disorganization have thus far kept it much below the pre-war level. The Belgian industry shows encouraging features, and exports are increasing. Domestic demand, however, is heavy, and the amount Belgium can export will not greatly affect the international market in the immediate future.

"The only active competitors of the American iron and steel producers at the present time are the iron-makers of the United Kingdom. Steel output in the United Kingdom during the first five months of 1920, although at a lower rate than in 1917, was above the rate for any other year. Exports of iron and steel must still increase before they reach the rate maintained in 1913. Remarkable increases over exports for 1919 are shown by the British figures for the first four months of 1920. Gains were made in all the items except six, the gain for the different classes of products ranging from 8% to over 400%. The British position is improving and must not be underrated.

"The arrears caused by four years destruction of steel and by reduced output after the armistice cannot be made up in the near future by any country except the United States. Yet, in the first calendar year after the War, American pig-iron output dropped to 31,015,000 tons, which was 8,000,000 tons below that of 1918 and practically the level of 1913. The fact that this reduction occurred without financial or industrial disturbance is a matter for congratulation, but in view of the five years accumulated need of steel throughout the world it is a calamity. The first three months of 1920 showed an expanding rate of production, but the railroad strike brought about a serious reduction, so that the April output of pig-iron dropped to 2,740,000 tons. The total for the first five months of 1920 was 15,000,000 tons. In spite of fluctuations, production in the United States is being maintained at a rate more than double the present output of Germany and the United Kingdom combined.

"Despite unfavorable exchange, Canada must buy American sheets and plates to keep the wheels turning in her own industries. The United Kingdom received much larger quantities of steel ingots and billets from the United States in March 1920 than during the corresponding month of 1919. Steel for shipbuilding was exported to France in April of this year in spite of exchange difficulties, and shipments of steel plates to Italy in March exceeded those made in March 1919. It is to be expected that foreign customers will restrict their purchasing at times in response to disadvantageous exchange conditions, but in such periods the shortage grows and must eventually be met.

"Even assuming a production of pig-iron in 1920 equal to that of the best war-year, and a rate of export somewhat higher than that of the pre-war years, the exportable surplus of the United States is not likely to equal Germany's annual exports in the years immediately preceding 1914. The United Kingdom is unable at present to recover her former volume of exports except at a sacrifice of domestic needs. There can be no question, therefore, as to sufficient foreign outlets for all the United States can spare and more. The American iron and steel industry has the resources, the capacity, and the industrial organization to produce largely beyond domestic needs. A responsibility rests upon this country to maintain production at a point where the industry can do its share toward satisfying the world-wide need of steel."

ETHEL: Who was that new girl I saw you with last night?

JACK: That wasn't a new girl. That was my old girl painted over.—'The Stover Striver.'

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OPENING THE NATIONAL DEMOCRATIC CONVENTION

Industrial Questions in the Party Platforms

During the past two months, the two great political parties of the country have met in convention, fulminated against each other, and made various promises as to what they would do if victorious in November. Two other important National bodies, namely, the American Federation of Labor and the National Association of Manufacturers, have also met recently and announced what they would like to have the parties support. Samuel Gompers and other representatives of the Federation were active at both conventions in attempting to get the party platform-makers to adopt the Federation's recommendations. While the other organization was not so much in evidence, its members doubtless exerted their influence in ways that seemed to them to be most effective. This article will attempt to bring out the essential statements in the platform of the two parties regarding industrial and allied questions, and to indicate how successful were the activities of the two non-political bodies at both conventions, activities which, we have no doubt, were entirely legitimate.

The first thing made evident by a study of the four pronunciamentos is that the statements made by the non-political bodies are clear and to the point, while those of the parties frequently are not. It must be remembered, however, that the non-political bodies discussed mainly questions on which their members were fairly well agreed. Had these organizations been confronted by the problem of the political parties, namely, to get as many votes and to offend as few voters as possible, they would probably have followed much the same course as did the political platform-makers.

In the analysis below, exigencies of space have made it necessary in most cases to quote only the essential statements of each plank. Where the sense and not the wording of the provisions is given, quotation marks are omitted.

Peace Treaty and League of Nations

National Association of Manufacturers. Not mentioned.

American Federation of Labor. Ratification of peace treaty "without any reservations that would tend to injure the effectiveness of the covenant of the League of Nations".

Republican Party. "We favor a liberal and generous foreign policy, founded upon definite moral and political principles, characterized by a clear understanding of and firm adherence upon our own rights and unfailing respect for the rights of others. We should afford full and adequate protection to the life, liberty, and property and all international rights of every American citizen and should require a proper respect for the American flag; but we should be equally careful to manifest a just regard for the rights of other nations. * * * Subject to a due regard for our international obligations, we should leave our country free to develop its civilization along the line most conductive to the happiness and welfare of the principle and to cast its influence on the side of justice and right should occasion require."

Democratic Party. * * * "We advocate the immediate ratification (of the treaty) without reservations which would impair essential integrity; but do not oppose the acceptance of any reservations making clearer or more specific the obligations of the United States to its league associates. * * *"

Federal Taxation

National Association of Manufacturers. "Our tax law * * * requires without delay remedial, non-partisan revision. * * * The Excess Profits tax is a misnomer without foundation in fact. * * * Its repeal and the substitution for it of a tax on gross final sales of goods, wares and merchandise would serve the public interest. The higher rates of the surtax operate to the public disad-

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vantage. * * * Any sound system of taxation must distinguish in its rates between income reinvested in useful production and that consumed in personal satisfaction. New and varied forms of indirect impost deserve extensive investigation."

AMERICAN FEDERATION OF LABOR. No special provisions under this heading. Under remedies for the High Cost of Living appears this paragraph.

"We demand the Federal government, through the Internal Revenue Department, ascertain the amount of excessive war profits extorted from the American people during the years 1916, 1917, 1918, 1919, and 1920, and that these excessive war profits be taken through its taxing power by the Federal government and applied to the extinguishment of the floating debt of the government and to the partial retirement of Liberty bonds at par * * *."

REPUBLICAN PARTY. * * * "sound policy equally demands the early accomplishment of that real reduction of the tax burden which may be achieved by substituting simple for complex tax laws and precedure, prompt and certain determination of the tax liability for delay and uncertainty, tax laws, which do not, for tax laws which do excessively mulct the consumer or needlessly repress enterprise and thrift.

"We advocate the issuance of a simplified form of income returns; authorizing the treasury department to make changes in regulations effective only from the date of their approval; empowering the commissioner of internal revenue, with the consent of the taxpayer, to make final and conclusive settlements of tax claims and assessments barring fraud and the creation of a tax board consisting of at least three representatives of the taxpaying public and the heads of the principal divisions of the bureau of internal revenue to act as a standing committee on the simplification of forms, precedure and law and to make recommendations to the congress."

DEMOCRATIC PARTY. * * * "We advocate tax reform and a searching revision of the war revenue acts to fit peace conditions so that the wealth of the nation may not be withdrawn from productive enterprise and diverted to wasteful or unproductive expenditure. We demand prompt action by the next Congress for a complete survey of existing taxes and their modification and simplification with a view to securing greater equity and justice in tax burden and improvement in administration."

INDUSTRIAL RELATIONS

NATIONAL ASSOCIATION OF MANUFACTURERS. (Declarations on this subject cannot be dissociated from statements regarding allied subjects and no attempt has been made to do so.) "The organization of many into an effective combination for the protection or promotion of their common interests * * * is a familiar feature of our time. * * * such forms of co-operation, rightly used, are splendid tools for individual and social progress. Abused, they become the most deadly weapon organized selfishness can employ against society. The regulation of such combinations by definition of their limitations is therefore among the most important duties of government.

"The right to organize and act in combination, whether by employer or employee, corporation or union, is relative and not absolute. It ends where injury to the public interest begins. This principle has been widely applied to the business combinations during a quarter-century of regulation. The public interest now demands that it be equally applied, fairly but firmly, to all combinations.

"The right to strike or lockout, which is merely an exercise of the right to act in combination, must be defined and limited wherever it conflicts with the community's paramount right of self-preservation. It is therefore essential:

"1. That the National and State Governments, each in their respective fields, shall assert and establish effective control over combinations operating in production and transportation essential to the life of the community.

"2. That the possession and exercise of power through combination shall be accompanied by corresponding responsibility. Every association, whether of employers or employees, must be equally subject to public authority and legally answerable for its own conduct and that of its agents.

"3. The life of government is its power to function. The right of government employees to adequate hearing and just and generous treatment must be amply protected, but the right of such employees to combine to stop or obstruct the operation of government does not exist.

"4. The paramount common interest in continuous public utility service empowers and obligates the government to control all combinations to paralyze or obstruct it and requires the ultimate submission of disputes threatening the interruption of such service to impartial adjudication without depriving the community of it.

"5. To preserve equality before the law, the same principles of conduct must apply to all classes of citizens under like circumstances. To make or propose to make it right and lawful for one class of citizens to do that which is unlawful or criminal when done by another class, or to prohibit or pretend to prohibit the use of public funds to enforce any law against an excepted group of possible offenders, is vicious. It should be condemned in principle and offending enactments repealed."

AMERICAN FEDERATION OF LABOR. The principal features in so far as they affect industrial relations of the 'labor plank' submitted by Mr. Gompers and other Federation officials to both political conventions are as follows:

That the right of the wage earners to organize into trade unions, to select their own representatives, and to bargain collectively be affirmed.

Maintenance of the Federal law enacted by Congress securing to the workers the legal right of voluntary association, protecting their rights against unwarrantable issuance of writs of injunction.

That no legislation shall be enacted which will compel the wage-earners to submit their grievances to courts or governmental agencies, and demanding the repeal of all such existing laws.

That there shall be no restrictions of the right of free speech, free press, free assembly, and free association.

Vigorous enforcement of the Seamen's act.

That the employment of children under 16 years of age for profit shall cease.

The rigid enforcement of the eight-hour law for Federal employees.

The enactment of a Federal compensation law that will embrace all Government workers.

That the products of convict labor be excluded from interstate commerce.

The repeal of the Cummins-Esch railroad law.

That the Federal Courts shall not be permitted to declare unconstitutional acts passed by Congress.

REPUBLICAN PARTY. "We deny the right to strike against the Government; but the rights and interests of all Government employees must be safeguarded by impartial laws and tribunals.

"In public utilities we favor the establishment of an impartial tribunal to make an investigation of the facts and to render a decision to the end that there may be no organized interruption of services to the lives and health and welfare of the people, the decisions of the tribunals

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to be morally but not legally binding, and an informed public sentiment to be relied upon to secure their acceptance. The tribunal, however, should refuse to accept jurisdiction except for the purpose of investigation, as long as the public service be interrupted. For public utilities we favor the type of tribunal provided for in the transportation act of 1920.

"In private industries we do not advocate the principle of compulsory arbitration, but we favor impartial commissions and better facilities for voluntary mediation, conciliation, and arbitration, supplemented by full publicity. . .

"The Government should take the initiative in inviting the establishment of tribunals or commissions for the purpose of voluntary arbitration and investigation of this issue.

"We demand the exclusion from interstate commerce the products of convict labor.

"There are two different conceptions of the relations of capital and labor. The one is contractual, and emphasizes the diversity of interests of employer and employee. The other is that of co-partnership in a common task.

"We recognize the justice of collective bargaining as a means of promoting good will, establishing closer and more harmonious relations between employer and employees, and realizing the true end of individual justice.

"The strike or the lockout as a means of settling industrial disputes, inflicts such loss and suffering on the community as to justify government initiative to reduce its frequency and limit its consequences."

DEMOCRATIC PARTY. "Labor is not a commodity; it is human. * * * Laws regulating hours of labor and conditions under which labor is performed, when passed in recognition of the conditions under which life must be lived to attain the highest development and happiness, are just assertions of the national interest in the welfare of the people.

"At the same time, the nation depends upon the production of labor; a cessation of production means loss and, if long continued, disaster. The whole people, therefore, have a right to insist that justice shall be done to those who work, and in turn that those whose labor creates the necessities upon which the life of the nation depends must recognize the reciprocal obligation between the worker and the State. * * *

"Labor, as well as capital, is entitled to adequate compensation. Each has the indefeasible right of organization, of collective bargaining, and of speaking through representatives of their own selection. Neither class, however, should at any time, nor in any circumstances, take action that will put in jeopardy the public welfare. Resort to strikes and lockouts which endanger the health or lives of the people is an unsatisfactory device for determining disputes, and the Democratic party pledges itself to contrive, if possible, and put into effective operation a fair and comprehensive method of composing differences of this nature.

"In private industries we are opposed to compulsory arbitration as a method plausible in theory, but a failure in fact. With respect to government service we hold distintely that the rights of the people are paramount to the right to strike. However, we profess scrupulous regard for the conditions of public employment and pledge the Democratic party to instant inquiry into the pay of government employees and equally speedy regulations designed to bring salaries to a just and proper level."

RAILROADS

NATIONAL ASSOCIATION OF MANUFACTURERS. "We approve the return of the railroads to their owners, who are the investing public, and favor their private ownership and operation under government regulation. * * *

"The controlling principle of public railroad administration should * * * be the promotion and development of a carrying service fully adequate for national needs.

"We favor the permissive consolidation of existing railway systems under such conditions as will promote economies of operation, efficiency in management, and maintain competitive rivalry in service.

"We favor the development of a definite and constructive plan of national transportation, inter-relating railroads, water-ways, and hard-surfaced roads.

"Every available means should be employed to promote better understanding and closer co-operation between the public and the railroads. The deliberate obstruction or interruption of transportation service is intolerable. Railroad strikes inevitably become lockouts of the farmer and factory-worker and boycotts of the public."

AMERICAN FEDERATION OF LABOR. By divided vote and over the opposition of Mr. Gompers, the Federation at its Montreal Convention adopted a resolution calling for government ownership of the railroads "with democratic operation". However, the 'labor plank' submitted to the party conventions called merely for the repeal of the Esch-Cummins bill, mainly because of its strike provisions.

REPUBLICAN PARTY. "We are opposed to government ownership and operation or employee operation of the railroads. * * *

"There should be no speculative profit in rendering the service of transportation; but * * * a fair return upon actual value of the railway property used in transportation should be made reasonably sure. * * *

"We endorse the transportation act of 1920 enacted by the Republican Congress as a most conservative legislative achievement."

DEMOCRATIC PARTY. "The railroads were subjected to Federal control as a war measure without other idea than the swift transport of troops, munitions, and supplies. * * *

"There should be a fair and complete test of the [Esch-Cummins] law until careful and mature action by Congress may cure its defects and insure a thoroughly effective transportation system under private ownership without government subsidy at the expense of the taxpayers of the country."

REGULATION OF TRADE

NATIONAL ASSOCIATION OF MANUFACTURERS. "It is not the function of our Government to own or operate industry but to protect and encourage its legitimate development under private ownership and management. It should therefore abstain from competition with its own citizens in any form of business which they can successfully undertake.

"The regulation of free enterprise is justified by necessity, when for the common good, but the form it assumes is vindicated only by the practical test of its effectiveness to accomplish its avowed purpose. * * *

"Business men should be able to ascertain, in advance of contemplated action, and with reasonable certainty, from the terms of the law, or the practical decision of administrative authority, whether their conduct or practices are permissible or forbidden.

"The Federal Trade Commission, proposed and advertised as a guide to honest enterprise, is multiplying its perplexity. It is inquisitorial beyond its authority, and as administered represents government by men and not by law."

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AMERICAN FEDERATION OF LABOR. No specific provisions in the 'labor plank'. The executive council of the Federation has made numerous recommendations regarding the cost of living, which, in effect, would amount to further regulation of trade.

REPUBLICAN PARTY. "We approve in general the existing Federal legislation against monopoly and combinations in restraint of trade, but since the known certainty of a law is the safety of all, we advocate such amendment as will provide American business men with better means of determining in advance whether a proposed combination is or is not unlawful. The Federal Trade Commission, under a Democratic administration, has not accomplished the purpose for which it was created. The Commission properly organized and its duties efficiently administered should afford protection to the public and legitimate business interests. There should be no persecution of honest business, but to the extent that circumstances warrant we pledge ourselves to strengthen the law against unfair practices."

DEMOCRATIC PARTY. "The Democratic party heartily indorses the creation and work of the Federal Trade Commission in establishing a fair field for competitive business, free from restraints of trade and monopoly, and recommends amplification of the statutes governing its activities so as to grant it authority to prevent the unfair use of patents in restraint of trade."

TARIFF

NATIONAL ASSOCIATION OF MANUFACTURERS. "The War has completely changed the basis of our foreign trade relations. * * * Our tariff policy should therefore be framed in the light of these conditions and of its relation to a scientific revision of our system of taxation. * * *"

AMERICAN FEDERATION OF LABOR. Not discussed.

REPUBLICAN PARTY. "The uncertain and unsettled conditions of international balances, the abnormal economic and trade situation of the world, and the impossibility of forecasting accurately even the near future precludes the formulation of a definite program to meet conditions a year hence. But the Republican party reaffirms its belief in the protective principle and pledges itself to a revision of the tariff as soon as conditions shall make it necessary for the preservation of the home market for American labor, agriculture, and industry."

DEMOCRATIC PARTY. "We reaffirm the traditional policy of the Democratic party in favor of a tariff for revenue only and confirm the policy of basing tariff revision upon the intelligent research of a non-partisan commission, rather than upon the demands of selfish interests, temporarily held in abeyance."

MERCHANT MARINE

NATIONAL ASSOCIATION OF MANUFACTURERS. "Successful commerce and national security require an adequate privately owned and operated American merchant marine, composed of ships built in American yards, of American material, by American labor, manned, officered, and owned by Americans, and sailing without handicap under the National flag. To this end, we urge the termination, through due notice, of all treaties or commercial conventions with foreign nations which restrain our Congress from enacting appropriate independent protective and promotive legislation."

AMERICAN FEDERATION OF LABOR. Not discussed.

REPUBLICAN PARTY. "The national defense and our foreign commerce require a merchant marine of the best type of modern ships flying the American flag, manned by American seamen, owned by private capital, and operated by private energy. We endorse the sound legislation recently enacted * * * that will ensure the promotion and maintenance of the American merchant marine.

"We favor the application of the workmen's compensation act to the merchant marine.

"We recommend that all ships engaged in coastwise trade and all vessels of the American merchant marine shall pass through the Panama Canal without premium of tolls."

DEMOCRATIC PARTY. "* * * We pledge the policy of our party to the continued growth of our merchant marine under proper legislation so that American products will be carried to all ports of the world by vessels built in American yards, flying the American flag."

BUDGET SYSTEM

NATIONAL ASSOCIATION OF MANUFACTURERS. "* * * economies in public expenditure will be permanently secured only by the enactment of an effective budget system."

AMERICAN FEDERATION OF LABOR. Not discussed.

REPUBLICAN PARTY. "We congratulate the Republican Congress on the enactment of a law providing for the establishment of an executive budget as a necessary instrument for a sound and business-like administration of the national finances, and we condemn the veto of the President which defeated this great financial reform."

DEMOCRATIC PARTY. "In the interest of economy and good administration, we favor the creation of an effective budget system that will function in accord with the principles of the Constitution. The reform should reach both executive and legislative aspects of the questions. The supervision and preparation of the budget should be vested in the Secretary of the Treasury as the representative of the President. The budget, as such, should not be increased by the Congress except by a two-thirds vote, each house, however, being free to exercise its constitutional privilege of making appropriations through independent bills. The appropriation bills should be considered by single committees of the House and Senate. The audit system should be consolidated and its powers expanded so as to pass upon the wisdom of, as well as the authority for, expenditures.

"A budget bill was passed in the closing days of the session of the Sixty-sixth Congress which, * * * the President was obliged to veto. The House amended the bill to meet the executive objection. * * *"

IMMIGRATION

NATIONAL ASSOCIATION OF MANUFACTURERS. "We believe it is in the interest of the Nation to replace our present unsystematic control of the alien with a constructive policy of selective immigration. The general proposition of opposing immigration is the counsel of bigotry or selfishness. * * * we should effectively exclude the diseased, the criminal, the defective, those likely to become a charge on the public, and any who oppose all forms of government, or who would overthrow this Republic, or effect political change by force."

AMERICAN FEDERATION OF LABOR. The flow of immigration should not at any time exceed the Nation's ability to assimilate and Americanize foreigners.

REPUBLICAN PARTY. "* * * The immigration policy of the United States should be such as to ensure that that number of foreigners in the country at any one time shall not exceed that which can be assimilated with reasonable rapidity, and to favor immigrants whose standards are similar to ours.

"The selective tests that are at present applied should

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be improved by requiring a higher physical standard, a more complete exclusion of mental defectives and of criminals, and a more effective inspection applied as near the source of immigration as possible, as well as at the port of entry. * * *

"The existing policy of the United States for the practical exclusion of Asiatic immigrants is sound and should be maintained."

DEMOCRATIC PARTY. "The policy of the United States with reference to the non-admission of Asiatic immigrants is a true expression of the judgment of our people and to the several States whose geographical situation or internal conditions make this policy and the enforcement of the laws enacted pursuant thereto, of particular concern, we pledge our support."

The above analysis would indicate that, judging from the platforms, not always a safe guide, we may look for the following:

1. If the Democrats win, ratification of the Treaty will follow, with as few reservations as the Senate may be persuaded to accept. The Republicans would be entirely consistent with their platform, whatever action they took.

2. Both parties would modify the present system of taxation, but neither is clear as to how to go about it.

3. Both parties are opposed to strikes of employees in the Government service, and also to compulsory arbitration in private industrial disputes. Both parties are in favor of doing everything possible to prevent strikes affecting the public interest. As to methods of doing so, the Democratic platform deals mainly in generalities, while the Republicans advocates investigation of industrial disputes and reliance upon public opinion to force compliance with recommendations.

4. Both parties are opposed to Government ownership or operation, and favor leaving the laws pertaining to railroads as they are, for the present at least.

5. The Democratic platform endorses the Federal Trade Commission, while the Republican claims that it has gone outside of its proper activities.

6. Just what might happen to the tariff in either party's success cannot be predicted.

7. Both parties are strong for a merchant marine.

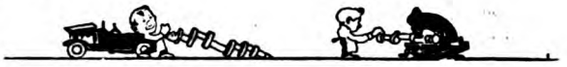
8. Both parties favor a budget system, but differ regarding the budget bill passed at the last session of Congress.

9. Both parties favor revision of our immigration laws, but state nothing specific. Both parties oppose Asiatic immigration.

A TALE of woe, on Sir Arthur Shirley Benn, head of the British Trade Mission, was told at dinner recently. Sir Arthur, when he arrived in the United States, brought his own supply with him—in a golf bag. Recently the supply was exhausted—all save a half bottle of real stuff.

Calling in some of his fellow delegates, Sir Arthur proposed a final drink. Glasses were filled, the bottle was emptied, and a toast proposed. Sir Arthur likes water in his. And at some of the American hotels where he had stopped, they had cute little taps stuck in the wall or into the washbowl from which ice water flows when the button is pressed.

This was the last drink and Sir Arthur wanted to be careful. So he pressed the button carefully. Then he tried to down his drink. He didn't; he had made a mistake, a most grievous mistake. Instead of the ice-water tap he had used a tap that yielded liquid soap.—'Los Angeles Times.'



Duplexing Electric Furnace and Cupola to Reduce Sulphur

In a paper presented before the American Society of Mechanical Engineers, Richard Moldenke called attention to the increased use of scrap in cupola mixtures during the War, and to the problem presented to the foundryman when at some future time these castings with their high proportion of sulphur, become scrap and come back to the foundry for remelting. The Pacific Coast foundryman, accustomed as he is to cupola mixtures where the scrap approaches the 100% limit, may be amused at the lament that, while in the Eastern foundries 40% scrap was the maximum before the War, it is now more likely to be 60%. However, the remedies proposed by Mr. Moldenke for high sulphur-content in the scrap charge are of interest to foundrymen wherever they may live.

While it is true that even a sulphur-content as high as 0.20% will not militate against machinability provided the melting practice is of the best, nevertheless, the danger from shock and from casting-strains is high. The old method of meeting high sulphur-content in the scrap was to increase the proportion of pig-iron. The alternative is a desulphurization process. Until recently no method of this kind was available, but fortunately the electric furnace has been adapted to this purpose and is doing the work with complete satisfaction. Instead of melting the charges from the cold state, as is the case in electric-steel developments, the regular cupola method is employed and the molten metal is transferred to an electric furnace having a basic lining. In this way the heavy current variations are avoided and by taking advantage of the comparatively cheap cupola-melting cost, that of the electric furnace for refining only is materially reduced. It is a question whether more than a quarter of a cent is thus added to the cupola melting cost per pound of metal 'duplexed', provided current is cheap.

Molten cupola metal with as much as 0.12% sulphur may thus be brought down to about 0.05% and even lower. Moreover, the metal is highly superheated, and thoroughly deoxidized. The castings made are therefore much better and sounder than the ordinary run, equaling charcoal-iron castings made in the air-furnace. The first cost of the installation is high, but soon pays for itself in the quality of work turned out. While developed during the war period it is none the less a logical sequence in the world advance of the art of making iron castings.

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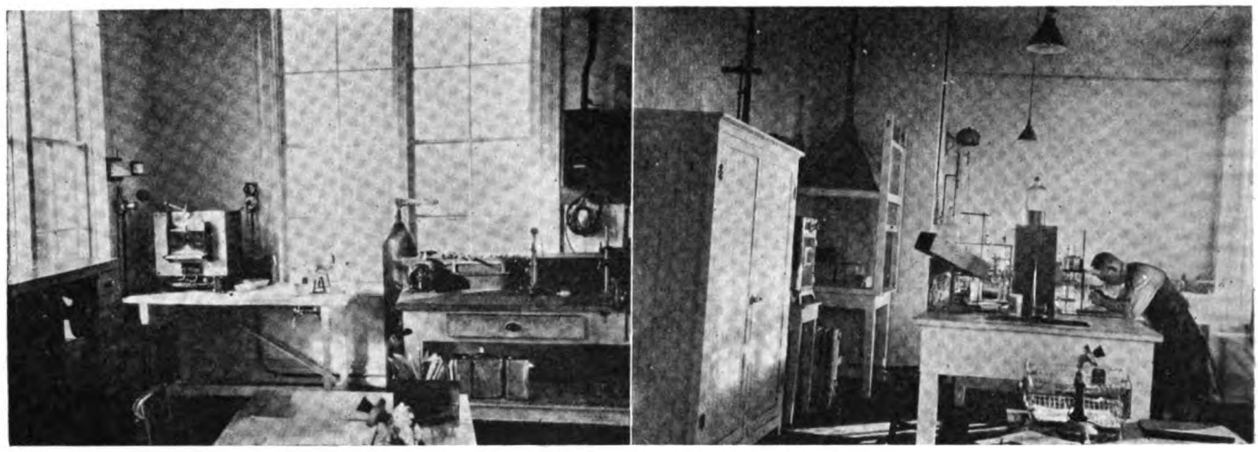

TWO VIEWS OF THE LABORATORY AND EQUIPMENT

Laboratory at the Holt Manufacturing Company

The laboratory at the Stockton plant of the Holt Manufacturing Company was established in January of this year. The apparatus includes, besides the regulation glass-ware for chemical determinations, one Hoskins electric furnace, using 3.9 amperes, 110 volts, the heating chamber of which is 5½ by 7½ by 14 in., one Hoskins combustion furnace for determining carbon by direct combustion, one multiple-unit crucible furnace, 2 by 2½ in., one Brown differential-type critical-temperature apparatus for determining critical temperatures of steel, one Fraes 600-watt electric drying oven, one complete microphotographic apparatus, furnished by Bausch & Lomb Manufacturing Co., arranged to magnify and photograph samples up to 1000 diameters, and one 30,000-lb. Riehle tension-machine.

The activities of the laboratory are three-fold—

1. To determine the chemical and physical properties of purchased materials so as to ensure that the company receives material according to specifications.

2. To control and govern the metallurgical operations throughout the plant to make sure that the products of the foundry and heat-treating departments meet the requirements of the exacting Holt standards and will give maximum service when they go into the assembly of the complete machine.

3. To engage in research along various lines, particularly to determine the suitability of materials, either in use or proposed, for the work for which they are employed.

Allied to the second and third activities is the testing of parts that have failed in service in the experimental tests made by the company or that have been returned from the finished machine as being defective. This work is carried on to determine, if possible, the causes of failures and the methods by which similar failures may be avoided.

Request for inspection of material purchased comes to the laboratory on the form shown in Fig. 1, (Form 913). This is made in triplicate, one copy being retained by the Receiving Department, which makes the request, and two copies being forwarded to the laboratory together with the sample, which is placed in the envelope shown in Fig. 2. Upon arrival in the laboratory, the request is filed on the form shown in Fig. 4, both request and sample are given a report number, and placed in the 'Work in Progress' file. Upon completion of the work, the samples are held for a certain period in case a re-testing is desired, the original of Form No. 913 is placed on file in the laboratory and the duplicate sent to the Receiving Department as a report.

Practically the same procedure is followed for testing material in process of manufacture, the only difference being in the form used, as shown in Fig. 3, (Form No. 914). The system for handling records is simple, but it works, which is all that is required.

The materials tested in the laboratory are all steels, cast-iron, and foundry raw materials, brass, babbitt, solder, paints, oils, and practically all other materials which enter either directly or indirectly into the construction of products of the factory. At the present time a good many of these materials are purchased according to specifications, and gradually, as marketing conditions improve, specifications will be prepared for all materials. Part of the research work in the laboratory is in preparing these specifications and determining the advisability of making changes in those already adopted.

It must be understood, however, that the marketing conditions, as mentioned above, are such that it is difficult or impossible to obtain certain materials to conform exactly to the Holt specifications, so that certain allowances are necessary in the specifications. It is an important function of the Metallurgical Department to determine whether changes in the specifications can be made without endangering the quality of the product, and, if changes are permissible, to specify their nature. In any case, temporary departures from specifications are

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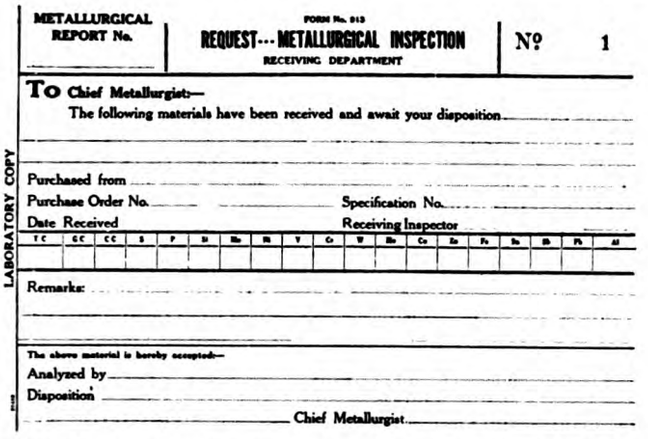
permitted only when absolutely unavoidable, and only in the case of parts of minor importance.

The microphotographic equipment is used primarily for research work, but it is also particularly applicable in the study of parts that have failed in service and the detecting of flaws in material that cannot be determined in


METALLURGICAL REPORT No. _____

FORM No. 913

REQUEST--- METALLURGICAL INSPECTION
RECEIVING DEPARTMENT

No 1

To Chief Metallurgist:—
The following materials have been received and await your disposition.

Purchased from
Purchase Order No. Specification No.
Date Received Receiving Inspector

TC	CC	CC	S	P	Si	Mn	Ni	V	Cr	W	Mo	Co	Zn	Pb	Sn	Bi	Pb	Al

Remarks:

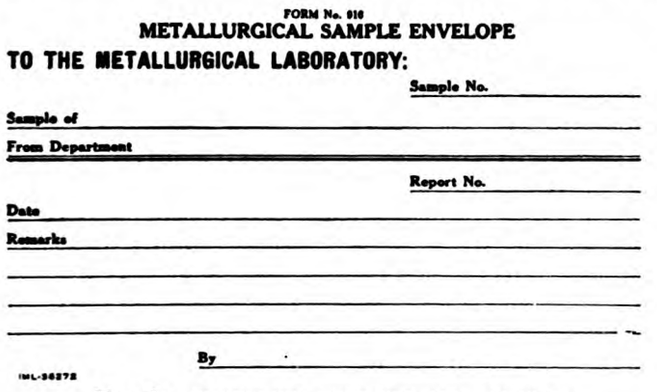
The above material is hereby accepted—
Analyzed by
Disposition
Chief Metallurgist

LABORATORY COPY

FIG. 1. FORM USED FOR TESTS OF PURCHASED MATERIALS

any other manner. Chemical analysis by itself goes a long way, yet the final word in the determination of the properties of the material comes from the microphotographs.

All fuels with the exception of fuel oil, (known as crude oil), are subjected to the fractional distillation test


FORM No. 816

METALLURGICAL SAMPLE ENVELOPE

TO THE METALLURGICAL LABORATORY:

Sample No.

Sample of

From Department

Report No.

Date

Remarks

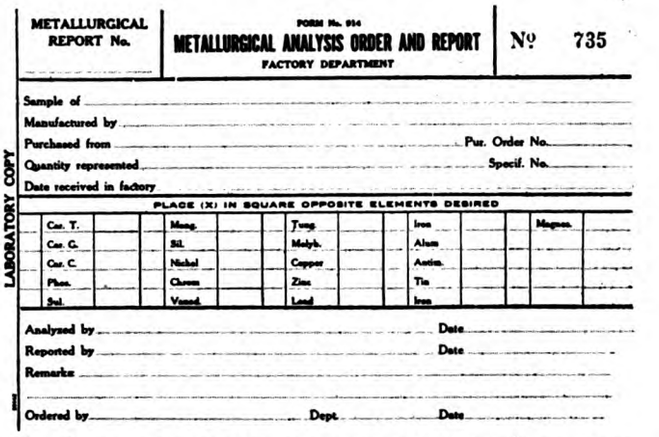
By

IML-36272

FIG. 2. ENVELOPES USED FOR ALL SAMPLES

besides the usual gravity, flash, fire, etc. Similar work is done on lubricating oils, giving all the physical properties that can be determined in a laboratory of this size. In connection with the oil work, the laboratory determinations govern the operation of a lubricating-oil reclaimer, determining the usability of the lubricating oil after it has been reclaimed. This latter testing is practically confined to the fractional distillation of the reclaimed oil in order to determine the percentage of dilution by fuel; as an additional check, the gravity, viscosity, and flash test are also given.

Tests of various kinds are required by the factory departments, but the greater portion of the factory department work lies in the chemical and physical test on the various steel specimens which are subjected to, or have


METALLURGICAL REPORT No. _____

FORM No. 914

METALLURGICAL ANALYSIS ORDER AND REPORT
FACTORY DEPARTMENT

No 735

Sample of
Manufactured by
Purchased from Pur. Order No.
Quantity represented Specif. No.
Date received in factory

PLACE (X) IN SQUARE OPPOSITE ELEMENTS DESIRED

Car. T.		Mang.		Tung.		Iron		Magnes.	
Car. G.		Sil.		Molyb.		Alum.			
Car. C.		Nickel		Copper		Antim.			
Phos.		Chrom.		Zinc		Tin			
Sul.		Vanad.		Lead		Iron			

Analyzed by Date
Reported by Date
Remarks

Ordered by Dept. Date

LABORATORY COPY

FIG. 3. FORM USED FOR TESTS FOR FACTORY DEPARTMENT

been, heat treated in some manner. The laboratory is in close co-operation with the Heat Treating Department, determining the proper heat treatment for each given kind of steel and the effects of various kinds of heat treatment as done in the shop. Similarly, as already noted, co-operation between the Service Department and the laboratory has given increased efficiency to both.

THE prisoner had been given a sentence of seven days without the option of paying a fine. The clerk had read out a long list of previous convictions.

"Well," asked the magistrate, "have you anything to say?"

"All I've got to say," remarked the prisoner in a hurt voice, "is that it's a pretty mean way to treat a regular customer."

FORM NO. 915

METALLURGICAL LABORATORY REPORT INDEX

DATE	SAMPLE OF	REPORT NO.	DEPT. NO.	FOR DEPARTMENT

FIG. 4. FORM FOR INDEXING REPORTS

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Standardization of Structural Shapes

During the War the Emergency Fleet Corporation undertook an investigation to ascertain definitely the number of structural shapes used in shipbuilding and the possibility of their standardization and reduction in number. At a conference of steel-makers held in Philadelphia on November 19, 1918, inasmuch as the British standard sections of ship-channels and shipbuilding bulb-angles appeared to be better adapted to economical manufacture than the American standard sections, and inasmuch, further, as the rolls turned in recent years to produce such sections conformed in general to British standards, it was decided that thereafter American standard sections should be discontinued and that rolls not then to British standards be re-dressed at as early a date as possible.

The British standard sections thus adopted as American standards were those adopted by the British Engineering Standards Association as published in 1903, and it was not known that this Association had undertaken a revision of the British standard sections in 1913, work on which, however, had been suspended by reason of the war activities. When, however, information as to what had been done in the United States came to the attention of the British Engineering Standards Association, that Association advised the American steel makers as to the situation and expressed its desire to have the American structural trade co-operate with the British Engineering Standards Association in the formation of common Anglo-American standards for structural shapes.

At the instance of the Association of American Steel Manufacturers, a Sectional Committee on Steel Shapes was organized under the auspices of the American Engineering Standards Committee. At a meeting held on April 27, 1920, it formulated recommendations for submission to its sponsor organizations, to the American Engineering Standards Committee and to the British Engineering Standards Association as a basis for common Anglo-American standards, and its conclusions are now to go before these organizations for further discussion and endorsement. The essential features of these recommendations are:

1. The adoption of the decimal system for the expression of dimensions, thicknesses, and other elements of order practice.

2. The adoption as an Anglo-American standard of the standard order-practice adopted by the Association of American Steel Manufacturers on February 20, 1920, under which structural shapes are to be ordered by weights per foot and not by thickness.

3. The adoption as an Anglo-American standard of American standard practice as it relates to ranges of thicknesses, methods of computation, and methods of publication.

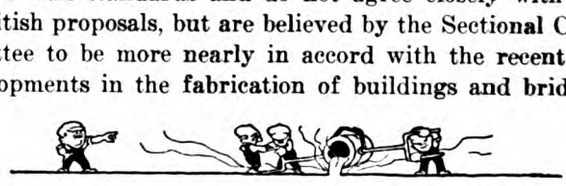
4. The adoption of definite ranges in thicknesses of angles and other structural shapes, under which are established two zones of variations between minimum and maximum thicknesses. Under 0.60 in. thick variations are fixed at 0.04 in. and above 0.60 in. thick at 0.08 inch.

5. Included in the list of angles is an equal angle (9 by 9 in.) and four unequal angles (8 by 4 in., 9 by 4 in., 9 by 6 in., and 10 by 4 in.), which are not now rolled in United States, but are subject to the considerations that weigh with manufacturers when new rolls are contemplated.

6. The adoption of a new line of bulb-angle sections as proposed by the British Engineering Standards Association. These are recommended on account of their greater efficiency as compared with present British and American standards.

7. The adoption of a single line of channel sections with a 5° flange-taper to displace the present two American lines, the structural line with its flange-taper 9° 27′ 42″ and the shipbuilding line with its flange-taper of 2°. This line of channel sections is not quite in accord with that proposed by the British Engineering Standards Association, but is believed to be more suitable to the requirements of the American trade and better proportioned.

8. The adoption of a new line of beam sections to take the place of the present American standards adopted in 1896. These sections have wider flanges than present American standards and do not agree closely with the British proposals, but are believed by the Sectional Committee to be more nearly in accord with the recent developments in the fabrication of buildings and bridges.



A LITTLE girl walked into a confectionery store, placed a nickel on the counter and called for an ice-cream cone.

"Ice-cream cones are 7 cents, little girl," the fizz clerk announced.

"Well, then, gimme a soda pop."

"Six cents."

"Got any root beer?"

"Yep, 6 cents, too."

The little girl sighed disappointedly and started out, leaving her nickel on the counter.

"Here, little girl, you're leaving your nickel," the clerk called to her.

"Oh, that's all right," the child shouted back. "It's no good to me—it won't buy anything!"—'Indianapolis News.'

"THE amount of money a fellow's father has doesn't seem to cut much figure here."

"No, it's the amount of the father's money the son has."—Yale Record.

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Studebaker Corporation Starts Novel Housing Plan

To assist in providing homes for its thousands of employees, and to reduce labor turnover, the Studebaker Corporation, with factories at South Bend, Indiana; Detroit, Michigan; and Walkerville, Ontario, is spending $2,000,000 this year in erecting suitable houses for its employees. The cost of the houses ranges from $2500 to $7500. These houses are not tenements but real homes with a variety of architectural designs. Some of these homes are being built on lots scattered through the town; others are on three different tracts bought and subdivided especially for this purpose.

The important feature of the project is, however, the plan adopted for sale of these homes to employees. The price is to be actual cost, with a small payment down, and the balance on deferred payments extending over a period of ten years. If a man continues in the employ of the company during the life of the contract, the interest due on deferred payments will be remitted each year. In the ordinary deferred-payment contract, a large part of the payments, sometimes as much as half the principal, goes for interest on deferred payments. This the workman saves under the Studebaker Corporation. The company, on the other hand, considers itself rewarded for remitted interest in reduced labor turnover.

The contract of sale specifies the amount to be paid each year, and also specifies a monthly rental. If an employee that is buying a home under this plan leaves the service of the company for any reason in less than five years after he signs the contract, the company retains title to the property and returns to him the amount that he has paid on the contract in excess of the stipulated monthly rental. If he stays with the company for more than five years after the signing of the contract and then leaves for any reason, he can take title to the property, but will not have the benefit of any remission of interest on his unpaid balance from that time. If he completes the terms of the contract, as noted above, all interest on deferred payments is remitted. Thus a man owing $5000 after making the initial payment on a house would be able to pay for it in ten years at the rate of a little over $40 per month.

It will be seen that a man making one of these contracts cannot lose, no matter how short his period of employment may be, while the amount he gains is dependent upon the length of time he stays with the company after signing a contract.

The Studebaker Corporation has been noted for some time for its sane welfare work, but since the appointment of C. A. Lippincott to have charge of the so-called Co-operative Department, about a year ago, this work has been considerably extended. Like the housing plan already described, the principal object of the plans described below is frankly stated to be to increase the proportion of continuous-service employees and to reduce the proportion of transients. The various plans are not put forward as additional compensation in place of increased wages, but rather as a participation in the profits of the corporation, rewarding employees for the increased value of their services from continuous employment, and from co-operative effort. Payments to employees under any of these plans are a fixed charge upon the business, are not dependent upon profits, and must be paid before dividends. Besides having charge of these plans, the Co-operative Department handles employment, safety, and other matters affecting the health, happiness, and prosperity of employees.

The anniversary-check-plan provides that employees shall receive checks on each anniversary date of their employment, based on their total earnings for the previous year as follows: On the first, second, third, and fourth anniversary, 5% of total earnings. On succeeding anniversaries, 10% of total earnings. Continuous service is required in order to qualify, although absence of 30 days or less due to sickness, vacations, suspension of operations, or leave of absence will be allowed. Absence without leave for one week or more will be considered a rupture of continuous service. Absence in war service will not affect an employee's record.

The so-called co-partnership plan provides that employees in the service of the corporation for three months or more may have common or preferred stock of the company purchased for them by the company for their account in amounts limited each year to 20% of their annual earnings and to $400 market value of stock at the time of purchase. The employee pays 10% of the cost of the stock at the time of making application and 40% more must be paid in four years. The corporation will absorb the remaining 50% by crediting the employee's account each three months for a period of four years with the proportionate part of the 50%. This is contingent upon continuous service by the employee, which is defined as under the anniversary plan. An employee may withdraw at any time, and either receive the stock by paying the balance due, or have the stock sold at the market and receive cash for the balance to his credit.

The pension plan provides that any employee whose annual earnings for the preceding five years averaged not more than $3000 per year, who has reached the age of 60, and who has been continuously in service of the corporation for 20 years or more, may retire on a pension equal to 25% of his average annual earnings for the preceding five years, with a minimum of $30 per month.

The anniversary, co-operative, and pension plans are to continue in force until December 31, 1920, in any event, and will presumably be continued indefinitely from that time. Provision is, however, made for adjustments in case they are discontinued at that time.

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The Problem of Taxation*

By WILLIAM B. COLVER†

As a result of the War, the American people find themselves, for the first time in the history of the Republic, faced by such a burden of public debt as will make taxation one of the big and ever-present problems for ourselves, our children, and our children's children. This being true, it is only ordinary prudence and business wisdom that taxation should be given the same serious and careful study that is given any other new and vital factor that disturbs our calculations. We must soon decide upon a taxation policy that will distribute the burden equitably and bear with the least possible weight upon the processes of industry and commerce, and so bear as lightly as such a gigantic load can be made to bear upon the ultimate consumer, who is every single one of us. We can either go through a long and painful period of passing the buck; of seeking to escape each his own share, or to pass it on; of hiding the tax or of taxing by classes; or we can meet the issue squarely and have it over once and for all.

In the future, taxes must be considered, and, by-and-large, we must make two choices of methods. First we must say whether we will try to hide the taxes we pay or whether we will mark them clearly and plainly, and, second, we must decide whether we will tax industry, effort, energy, productivity, or whether we will tax idleness, inaction, and failure to produce. Up to the present time we have chosen to penalize productive effort and to give a bonus to speculation and disuse. The more elaborately a tax is hidden, the more it costs. The disguise costs more than the tax.

The excess-profits tax, never a revenue measure, is a penalty upon economy, upon conservative capitalization, and upon quantity production. It never was intended to be a revenue measure. It is a corner-stone in the present intolerable price-structure and it should be repealed. We hear talk of increasing the percentages in the upper brackets of the income-tax schedule, especially with reference to raising another billion or two or three to provide a general soldier bonus. It is easy and popular to say 'tax the rich'. But what we are actually doing now is to tax the capital of the rich out of productive enterprises and into non-productive. As the law stands a man with a $20,000 income can invest in State or municipal bonds, non-taxable, at 4½% and with practically no risk, while to net the same rate of income any investment in industry or trade must yield him 5⅓%, to say nothing of the element of risk. The man with $50,000 income must receive 6½% from his productive investment in order to be able to pay his tax and yet net the 4½% that the non-taxable offers him. The $100,000 income must earn 10¼% and the $500,000 income must earn 15% in order to net the sure 4½% that the non-taxable State and municipal bonds pay.

Do these roads lead toward quantity production with lowered costs and prices, and useful employment for every man and every dollar? Or do they lead to an orgy of public expenditures and a steady reduction of production? I am for public works, but only when we can afford them and only in a reasonable proportion to the total national expenditure. I would rather see a new factory built in a town than a new post-office or a new city hall. I would rather see a new silo than a new concrete culvert. I am for good roads, but I would rather see the good road run from a mill to a freight depot than from the sheriff's office to the cemetery.

The question of safe, sane, consistent taxation is before us. Upon its correct solution the welfare of business, and therefore the public welfare, depends in a large degree.

Electric Smelting of Iron Ore With Coke

A recent issue of 'Chemical and Metallurgical Engineering' contain a translation of an article from the 'Teknisk Ukeblad' by Georg Stig, who has been engaged in the electric smelting of iron with both coke and charcoal at the furnaces at Domnarfvet, Sweden, since 1911. There are eight furnaces there, five of the Electrometal type, which has a single shaft, and three of the Heroult-Haanel-Tinfos type, which has several shafts. The Electrometal furnaces comprise three of the regular type, of 2800 kw., 5000 kw., and 7200 kw., one Helfenstein modification, of 4000 kw., and one Kopparberg modification of 5000 kw. The 7200 kw. furnace is the largest in the world for the electric production of pig-iron. The Heroult-Haanel-Tinfos furnaces are of 500 kw., 1000 kw., and 1500 kw. respectively.

While most of the electric smelting of iron ore in Sweden is done with charcoal, good results have also been obtained with coke. The unsatisfactory results that have also been recorded when smelting with coke are probably because the same design of furnace and the same procedure was followed as when charcoal was used. Where design and procedure were adapted to the use of coke, nearly as good results were obtained as when charcoal was employed.

The author tells of operating an Electrometal furnace, using charcoal, with an electrical efficiency of 80%. This furnace was designed for charcoal. When changed in such a way as experience had indicated would be desirable for coke, it showed an efficiency of 67% on a four weeks run with coke. The average load during this period was 2632 kw. The current was maintained at 14,000 amperes and 60 volts. The average production per day was 23 metric tons, indicating a consumption of 0.8 kw-hr. per pound. After smelting was well under way, the run was particularly quiet and even, without bridging of the charge or difficulties with the circulation of gas in the furnace.

*Extract from address delivered before the National Wholesale Grocers' Association.

†Member of Federal Trade Commission.

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INDUSTRIAL EQUIPMENT

THE SELECTION AND TREATMENT OF TRANSMISSION BELTS

By E. J. Black

The right and wrong ways of lacing belts are shown in the accompanying illustrations. The top and bottom views show a belt which has been properly laced. The holes were punched evenly and the lacing was done smoothly, leaving no loose ends which might catch and injure the belt. The middle view shows a belt improperly laced. The holes were punched in some instances so close together that the lacings tore through. A belt laced like this cannot be expected to give the maximum amount of service. The following detailed instructions as to the proper way of lacing may well be studied.

(1) Cut the ends of the belt absolutely square. Do not depend upon your eye or use an ordinary ruler. If the end is slanted in the least degree all the pull will come on one side of the belt and the consequences are likely to be disastrous. (2) Make the holes as small as practicable. Use an awl rather than a punch, wherever possible. (3) Leave a sufficient margin at the edge of the belt without holes so as not to impair its strength. In belts 2 to 6 in. wide, the holes should not be nearer to the edge than ½ in., in belts 6 to 12 in. wide not nearer than ⅝ in., and belts 12 to 18 in. wide not narrower than ¾ in. (4) Make two rows of holes, in parallel lines straight across the width of the belt, and stagger the holes, so that the strain comes upon different portions of the belt. (5) Be sure that the holes in the two ends to be joined match exactly. Otherwise there will be a 'jog' in the belt, and this is likely to result in tearing the belt lengthwise. (6) Use flexible lacing, being careful to have it proportionate to the size of the belt. A heavy lacing is likely to cause trouble. (7) In lacing the belt, make the pulley side as smooth as possible. Rough places and ends should be turned away from the pulley. (8) In using metal fasteners select those which place the strain on the length-wise strands of the belt. The cross-wise strands are not as strong as those which run length-wise.

Besides improper lacing, there are many other abuses which shorten the life of belts. Shafting that is out of line may cause an undue strain upon the belt and make it run off the pulley. Oil may be allowed to drip upon the belt and ruin it. The belt may be applied with an initial tension so great as to produce an unnecessary strain. Many complaints regarding unsatisfactory belt performance can be traced to the fact that the wrong belt was used on the job. No matter how good a belt is or how good treatment it receives it will fail to give satisfactory service if not adapted for the use to which it is put.

In deciding upon the right belt for any particular service there are eight factors to be considered: (1) distance between pulley centres; (2) diameter of the pulleys; (3) width of the pulleys; (4) use of idlers, cone pulleys, quarter turn, half turn, etc.; (5) speed; (6) horse-power to be transmitted; (7) character of the load (jerky or constant); and (8) conditions such as contact with moisture, oil, or other deteriorating influences.

Table for Finding the Horse-Power of a Belt

Speed in feet per minute

Width	Ply	200	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000
4"	4	1.45	3.64	7.27	10.9	14.5	18.2	21.8	25.4	29.0	32.7	36.4	40.0	43.6
	5	1.82	4.55	9.1	13.6	18.2	22.7	27.3	31.8	36.4	40.9	45.4	50.0	54.6
	6	2.18	5.45	10.9	16.4	21.8	27.3	32.8	38.2	43.6	49.0	54.5	60.0	65.5
5"	4	1.82	4.55	9.1	13.6	18.2	22.7	27.3	31.8	36.4	40.9	45.4	50.0	54.6
	5	2.27	5.68	11.4	17.1	22.8	28.4	34.1	39.8	45.5	51.1	56.8	62.5	68.2
	6	2.73	6.83	13.6	20.5	27.2	34.1	41.0	47.8	54.5	61.4	68.2	75.0	81.8
6"	4	2.18	5.45	10.9	16.4	21.8	27.3	32.8	38.2	43.6	49.0	54.5	60.0	65.5
	5	2.73	6.83	13.6	20.5	27.2	34.1	41.0	47.8	54.5	61.4	68.2	75.0	81.8
	6	3.28	8.18	16.4	24.6	32.8	40.9	49.1	57.3	65.5	73.7	81.8	90.0	98.2
8"	4	2.91	7.27	14.5	21.8	29.1	36.4	43.7	51.0	58.2	65.5	72.7	80.0	87.3
	5	3.64	9.1	18.2	27.3	36.4	45.5	54.6	63.6	72.7	81.9	91.0	100.0	109.2
	6	4.37	10.9	21.8	32.7	43.6	54.5	65.5	76.4	87.3	98.3	109.0	120.0	131.0
10"	4	3.64	9.1	18.2	27.3	36.4	45.5	54.6	63.6	72.7	81.9	91.0	100.0	109.2
	5	4.55	11.4	22.7	34.2	45.5	56.9	68.3	79.5	91.0	102.2	114.0	125.0	136.4
	6	5.46	13.65	27.3	40.9	54.5	68.2	81.8	95.5	109.0	122.6	136.4	150.0	163.6
12"	5	5.46	3.65	27.3	40.9	54.5	68.2	81.8	95.5	109.0	122.6	136.4	150.0	163.6
	6	6.55	16.3	32.7	49.1	65.5	81.7	98.2	114.4	130.9	147.0	163.5	180.0	196.0
14"	5	6.36	15.9	31.8	47.7	63.6	79.5	95.5	111.4	127.2	143.0	159.0	175.0	191.0
	6	7.64	19.1	38.2	57.3	76.4	95.5	114.6	133.8	152.8	172.0	191.0	210.0	229.2
16"	6	8.73	21.8	43.6	65.5	87.3	109.0	131.0	152.7	174.6	196.5	218.0	240.0	262.0
	8	11.63	29.1	58.2	87.3	116.3	145.3	174.6	203.5	232.6	262.0	290.6	320.0	349.2
18"	6	9.82	24.5	49.1	73.7	98.2	122.8	147.4	171.8	196.4	221.0	245.6	270.0	294.8
	8	13.09	32.7	65.4	98.3	130.9	163.4	196.6	229.0	261.8	294.0	326.8	370.0	393.2
20"	6	10.9	27.3	54.5	81.8	109.0	136.5	163.6	191.0	218.0	245.6	273.0	300.0	327.2
	8	14.5	36.4	72.7	109.0	145.5	181.9	218.0	254.5	291.0	327.7	363.8	400.0	436.0
24"	6	13.09	32.7	65.4	98.3	130.9	163.4	196.6	229.0	261.8	294.0	326.8	370.0	393.2
	8	17.4	43.6	87.2	130.8	174.4	218.0	261.6	305.0	348.8	392.0	436.0	480.0	523.2
30"	6	16.3	40.8	81.6	122.4	163.2	204.3	245.0	286.0	326.4	368.0	408.6	450.0	490.0
	8	21.8	54.6	109.0	163.8	218.0	272.8	327.6	382.0	436.0	492.0	545.6	600.0	655.0
30"	10	27.3	68.2	136.4	204.6	273.0	341.0	409.2	477.4	546.0	614.0	682.0	750.0	818.4
36"	8	26.2	65.5	131.0	196.5	262.0	327.5	393.0	458.0	524.0	589.0	655.0	720.0	786.0
	10	32.7	81.8	163.6	245.4	327.2	409.0	490.8	573.0	654.4	737.0	818.0	900.0	981.6
42"	8	30.5	76.4	152.7	229.2	305.4	382.0	458.4	535.0	610.8	687.0	764.0	840.0	916.8
	10	38.2	95.5	190.9	286.5	382.0	478.0	573.0	668.0	764.0	860.0	956.0	1050.0	1146.0
48"	8	34.9	87.3	174.5	261.9	349.0	437.0	523.8	612.0	698.0	786.0	874.0	960.0	1047.6
	10	43.6	109.0	218.0	327.0	436.0	546.0	654.0	764.0	872.0	982.0	1092.0	1200.0	1308.0

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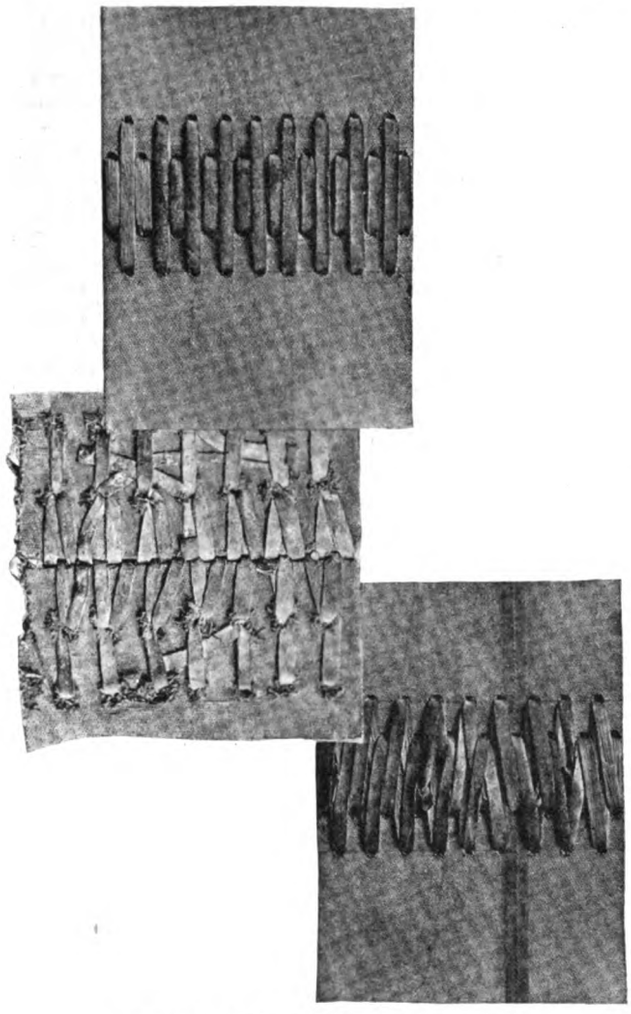
Over these factors the belt-man usually has little or no control. His problem is to take the conditions as he finds them, and apply a belt that will give the best service possible under the circumstances. Yet he may sometimes perform a real service by calling attention to a faulty arrangement, when the conditions are such that the fault may be corrected. Real economies may sometimes be effected by lengthening the distance between pulley centres, increasing the width of the pulley face, or by changing the arrangement of a vertical belt so as to give the drive a certain degree of slant.

The factors which are under the belt man's control are



Correct and Incorrect Methods of Lacing Belts

these: (1) The kind of belt to be used, such as rubber, leather, canvas, etc.; (2) the grade, whether cheap, medium, or high; and (3) the weight of the belt, such as 4 or 6-ply, single or double.

In determining the kind of belting to be used, the merits of rubber belting should receive full consideration. It is economical in first cost, extremely efficient in service, and frequently outlasts other constructions. On the other hand, in places where constant contact with oil is unavoidable, a rubber belt will not give good service. The constant use of shifters is also injurious to a rubber belt and may ultimately cause failure.

In deciding upon the right grade for a particular service, the points to be especially considered are the size of the pulleys, the presence of idlers or other unusual conditions, and the speed. Small pulleys, operated at high speed, necessitate a high-quality belt. The reason for this is the internal wear between the various plies of fabric, and even between the fibres in each ply, as the belt rounds the pulleys. A high-grade rubber friction is the best possible protection against this internal wear, because it protects each fibre with an elastic coating which remains uninjured and which indeed retains its life and elasticity longer when in use than when lying idle.

In this connection, it should not be forgotten that the value of a particular rubber friction cannot be determined merely by the test showing 'pounds pull'. If the plies were fastened together with glue, this test would show a very high-grade belt, but we all know that such a belt could not give service. The most valuable property of rubber friction is that intangible quality called 'life'. There is no known test for this but length of service. In specifying the proper ply for the installation, the determining factors are the size of the pulleys, width of the belt, speed, and the horse-power to be delivered. The belt itself should be at least one inch less in width than the face of the pulley to give the best results.

PULMORE PULLEY TREAD

Almost every user or operator of belt-driven machinery has experienced—sometimes more frequently than desirable—excessive belt-slip or unusual wear due to a greater loading than that for which either the belt or pulleys were intended. Sometimes the loading may be due to a need for greater production beyond anything the belt or pulleys were designed and built to deliver—or to a lack of definite knowledge at the start just what the loading would be. There are various temporary or inadequate and harmful remedies for these conditions, such as excessive belt tension to eliminate slip, but with the resultant shorter life of the belt; or belt-dressings which may materially reduce the length of service a good belt should be able to give to the operator.

Two permanent cures for excessive slip or overloading are larger pulleys and belts, or a pulley having friction surface equal to that of the belt. Pulmore pulley tread is a chemically treated fibre compressed into sheet form and it is easily applied to any kind of pulley simply by soaking in water for a few seconds to loosen up the chemical compound. When dry, it sticks to the pulley face and gives it a frictional tread equivalent to leather. Pulmore pulley tread gives this greater capacity equally well when used to cover iron, steel, wood, paper, or other pulleys used in connection with leather or other comparatively smooth-surfaced belts.

The difference in tractive friction is very apparent and is easily observed by one's sense of feeling in the case of an iron pulley, most of which is covered with the tread. In operation the uncovered part becomes polished and 'slippery' due to the constant creep or slip of the belt on the iron, while the treaded part presents a much more resistant surface alike to one's hand or fingers and to the belt. These then are the uses for Pulmore pulley tread:

1. By increased tractive friction obtained, to increase production with the same pulleys and belt.
2. To decrease belt-tension so that belts will last longer even when the same or greater power is transmitted.
3. To reduce frictional losses in bearings caused by excessive belt tension.
4. To lower first cost of pulleys, belts, and shafting by using smaller sizes.
5. To build up the crowning of worn pulleys or others needing a greater crown.
6. To eliminate troubles due to belts coming off because of excessive slip.

Bulletin No. 201, issued by Smith & Serrell, Newark, New Jersey, gives details of the merits, and directions for using Pulmore pulley tread.

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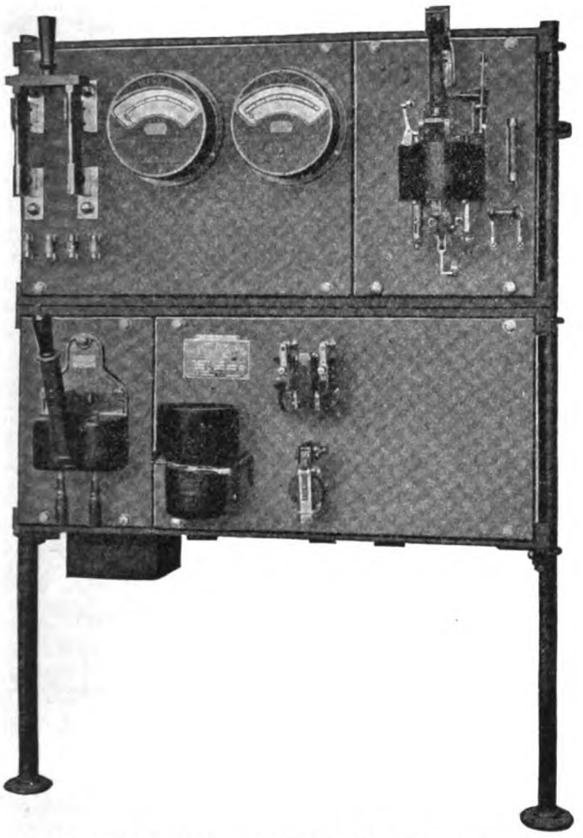
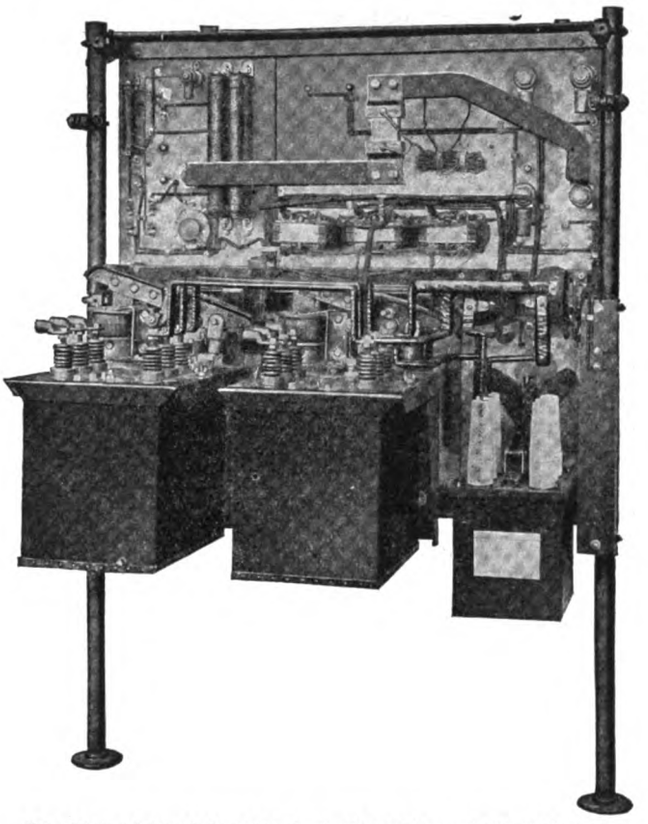
NEW AUTOMATIC CONTROL-PANEL FOR MOTOR-GENERATOR SETS

In shops and manufacturing plants where the direct-current supply is obtained from a motor-generator set, it is frequently advantageous to control the power equipment from some remote point, thus eliminating the necessity of an attendant at the switchboard. Several shops are using with their motor-generator sets an automatic control-panel, shown in the illustrations, which has all the protective features used in the small modern switchboards, and may be



Switchboard for Automatic Control of Motor-Generator Sets



Rear View of Board, Showing A. C. Oil-Switches and Circuit-Breaker

controlled from any remote point by means of an ordinary snap switch.

This automatic equipment, manufactured by the Cutler-Hammer Mfg. Co. of Milwaukee, consists of the necessary circuit-breakers, switches, relays, fuses, and recording instruments mounted on slate panels carried on a floor-type frame. The primary equipment of the control-panel shown in the illustration consists of a hand-operated oil circuit-breaker provided with inverse time overload attachments, a phase-failure and phase-reversal relay, and an automatic starter of the auto-transformer type. This is to be used with induction motors, but the same general equipment with a few slight changes can be used with motors of the synchronous type. On the direct-current side a knife-switch, voltmeter, and ammeter with the necessary fuses, and an automatic re-closing circuit-breaker are provided.

With the remote control-switch 'on' the controller may be operated by merely closing the main-line oil circuit-breaker, or the breaker may be left closed and the equipment operated by means of the remote control-switch. The closing of the main circuit-breaker effects the closing of the phase-failure and reversal relay, unless one or more of the phases are open or reversed, in which case the abnormal condition must be moved from the line before the relay will close. This relay has also the characteristics of a voltage-relay, so the equipment will not operate if the line-voltage is very low. After the relay closes, the automatic starter connects the motor through an oil-switch to the low-voltage taps of an auto-transformer. When the equipment has come up to speed, the oil-switch opens and a second oil-switch connects the motor directly to the supply-line, at the same time completing a circuit to the closing-coil of the automatic re-closing circuit-breaker, which immediately closes, establishing the generator voltage on the direct-current feeders. In case of an overload on the direct-current side, the circuit-breaker opens, and re-closes when the overload is removed. The oil-switches used on this equipment were described and illustrated in the March issue of 'Metal Trades'. These control-panels can be furnished in different capacities up to 300 kw. and, when desired, can be built for operating two motor-generator sets in parallel.

WHEEL SPEEDS*

By W. T. Montague

In general, we know that a soft wheel revolving rapidly will produce more than a hard one revolving more slowly. This is true because the more open structure of the soft wheel provides greater clearance for grinding-chips, and this gives a freer and cooler cutting action. Theoretically, therefore, the correct speed for grinding-wheels is the safe maximum speed at which the wheel may be operated.

In actual practice, however, certain ranges of peripheral speed have been found to give good results on certain classes of ground work. For example, a satisfactory wheel-speed for sharpening planer-knives is around 3500 surface feet per minute; for off-hand snagging of castings, 5500 surface feet per minute; for cylindrical grinding of crank-shaft pins and bearings, around 6000 surface feet per minute; and for cutting off hardened and high-speed steel, tubing, and the

*From 'Grits and Grinds'.

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like the proper speed approximates 9000 or 10,000 surface feet per minute.

These speeds have become established in the shops of this country today. Many times peculiarities in machine design may have, in part, been determining factors in the operating speeds of certain types of grinding machines. In surface-grinding, lower wheel-speeds are used than for cylindrical, because mechanical limitations usually prevent the work-table being traversed fast enough to keep the wheel-face open and free cutting. But, generally speaking, certain grits and grades of wheels operating under these speed conditions have given good results. As the grit and grade of a wheel are the chief means of its identification, certain narrow ranges of grade have become to be known as more or less standard for given grinding operations.

The point we wish to make is that wheel-speed and wheel-grade are closely related in the success or failure of any grinding-wheel used in off-hand operations. For cylindrical grinding, however, this does not apply because of the variety of work-speeds available, which take the place of variable wheel-speeds. In the operations mentioned above, the grade was made to suit the standard speeds determined. Hence, when a given grade of grinding-wheel is recommended for a certain operation, this recommendation is based on the assumption that the generally accepted speeds will be employed. Obviously, the grinding-wheel manufacturer must have some peg on which to hang his hat. There are so many variants entering into the problem that speeds must be standardized in order to specify grade intelligently.

It is generally believed that the faster a grinding-wheel revolves, the greater its productivity in a given time. This is not altogether true in precision operations, as in cylindrical grinding for instance. It is only true to a limited extent in off-hand grinding, like the snagging of castings.

In cylindrical grinding, the production of a given wheel is determined by the depth of cut, table-traverse, and diameter of the work. Hence, the controlling and limiting factors are rigidity and general sturdiness of the grinding machine to permit of deep cuts, and the traverse speeds of the table or wheel, if the wheel-head travels instead of the work-table.

Increase of wheel-speed in cylindrical grinding changes the size and shape of the chips cut off. In this case, the rate of production is not greatly affected, unless the higher speed permits the use of a softer wheel, which might cut more freely. But for a given wheel there is no difference in production, whether 4500 surface feet per minute or 6500 surface feet per minute is used, provided the grade or the work speed is adjusted to these different wheel speeds.

In off-hand grinding operations, we have a somewhat different condition. Here the grinding may be said to be done under constant pressure as contrasted to constant feed in cylindrical grinding as just described. For example, if a bar of metal is pressed against a revolving wheel-face under a given pressure, it is obvious that the faster the cutting grains come around, the quicker will succeeding sections of the bar be cut away. But in practice, this is true only up to a certain speed; for if the grade of a wheel is correct for a speed of 5000 surface feet per minute, there will soon come a point, if its speed is increased, when the wheel face will begin to glaze over, thus reducing its cutting capacity.

Nothing is really gained from increasing the wheel speed in off-hand grinding over the generally accepted range, unless wheels softer than those usually recommended are employed. The severe service to which many wheels are put in off-hand grinding discourages the use of soft grades.

From the foregoing, we might conclude that:

1. The grade of hardness to be recommended for a given grinding operation depends upon the surface-speed of the wheel.

2. The grinding-wheel should be as soft as is feasible for the operation and whenever possible operated at the high end of the recommended range of speeds.

3. For a given wheel used for precision-grinding operations, not much increase in production is to be expected from increasing the speed of the wheel alone.

4. The logical way to increase production in precision-grinding operations is to increase the traverse of the work past the wheel or the depth of cut of the wheel.

THE MULTI-GRADUATED PRECISION THREAD-GRINDER

For all types of internal and external thread-grinding the Precision & Thread Grinder Manufacturing Co., of Philadelphia, has developed the multi-graduated precision thread-grinder. Fig. 1 shows the model C grinder. While especially designed for thread grinding, the machines can also

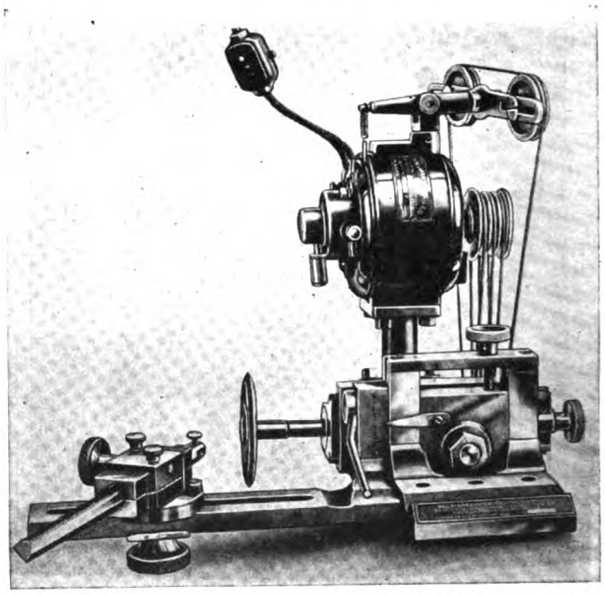

Fig. 1. Model C Grinding-Attachment

be used to advantage on a number of special grinding operations for which the ordinary machines are not suited, such as surfaces of peculiar angles, radii, both convex and concave, and combinations of straight and tapered surfaces, straight and curved surfaces, and straight, tapered, and curved surfaces. The machines can be used as attachments on any size and style of machine-tool. Fig. 2 shows the arrangement that can be used for using two wheels simul-

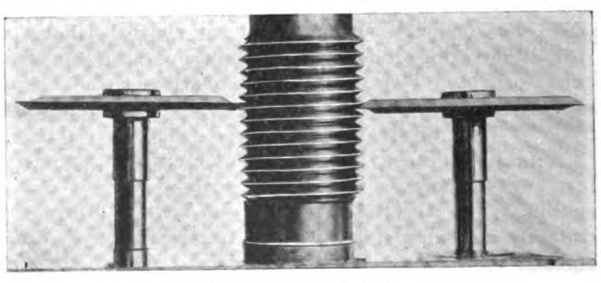

Fig. 2. Grinding Thread with Two Wheels

taneously. In this way a large lot of duplicate pieces may be ground rapidly, as after the setting of the wheels on the first piece, the setting is not disturbed, but the following parts are brought into lead with the wheels by means of an adjustable rotating lathe-dog. The wheels are beveled on one side only, so that each wheel grinds only one side of the thread-angle and on the root of the thread. Each wheel grinds on an opposite side of the angle to the other wheel.

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Both wheels grind on the root of the thread simultaneously. This is especially valuable in getting the sharp point in the bottom of the V-thread. This arrangement requires the use of the model C and D machines in combination.

INTELLIGENT USE OF PAINT CUTS LABOR COSTS

The most modern machinery, no matter how costly, is a paying investment if it causes increased production. In fact, any method of cutting production costs and increasing plant output is receiving serious consideration by captains of industry. For instance, less than a decade ago, factory lighting was not considered a matter of much importance. Employees were mostly low-paid people working long hours, and, even under bad lighting-conditions, production costs were low. But now there is hardly any such thing as cheap help; hardly anybody works long hours and few exert themselves to produce a full day's output. New factory buildings are mostly windows; old buildings are generally too dark. They can, however, be lightened up a great deal by painting the interior walls with a snow-white, washable oil paint having a maximum of light reflecting properties. The influence that a seemingly little thing like this has upon production is remarkable. Eye-strain causes headache. No operative will even try to produce to capacity when not in good physical condition. Better lighting removes the cause. Increased output, more accurate work, and less breakage and spoiling of materials pay many times for the painting.

LABOR-SAVING FOUNDRY EQUIPMENT

Foundry work at best is laborious, so that it is important that minimum weight shall be combined with maximum strength, in order that fatigue shall be reduced as much as possible and the greatest efficiency obtained. The 'P & O' line of appliances made by the General Welding & Manufacturing Co., of Milwaukee, have been designed with that end in mind. Fig. 1 shows the types of ladle-shanks manufactured. The rings are of solid cast-steel, and can be spread or closed to fit any shape of ladle-bowl. Light weight is obtained by the use of tubing for the handles and grips in place of solid bars. The swivel joint is entirely enclosed, cannot stick, and will not clog with sand. The fluted construction of the rings keeps the shanks cool by

Fig. 2. Tea-Kettle Spout Ladle

permitting circulation of air around the bowl. Fig. 2 shows a special tea-kettle spout ladle designed to prevent slag entering the mold. It has a capacity of about 60 pounds.

SAFEGUARDING ELECTRICAL EQUIPMENT

By D. H. Colcord

A committee of 77 expert actuaries employed by the National Board of Fire Underwriters have been working for two years, calculating, classifying, and tabulating fire risks to discover preventable hazards. They have something interesting to say about electrical hazards.

"The largest loss by fire from known causes in 1918 was attributed to exposure (including conflagrations), and amounted to $63,735,399. Electricity stood second with a property damage of $20,780,307. Matches and smoking came third with $16,453,565. The damage from electricity resulting from the wider distribution of current for power, lighting, and heating is $894,785 greater than that of 1917."

Alarming! Not necessarily so when one considers the

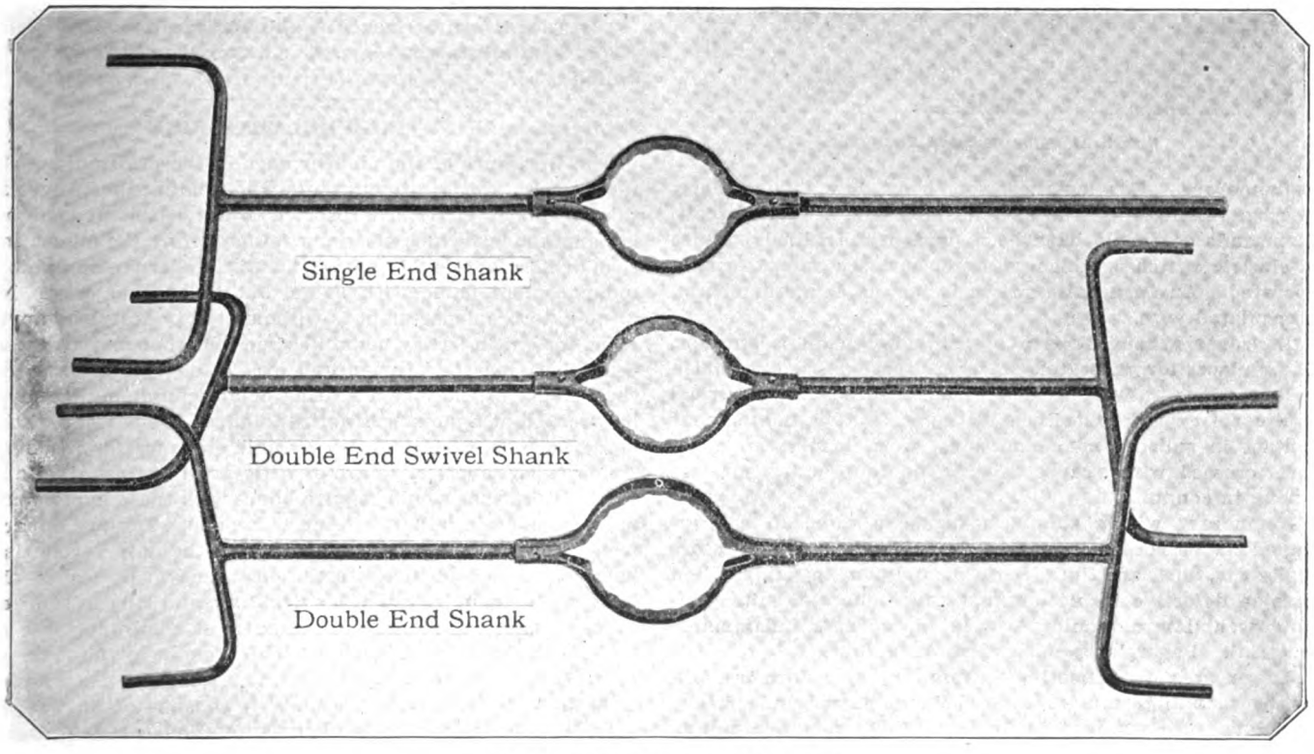

Fig. 1. Various Types of Ladle-Shanks

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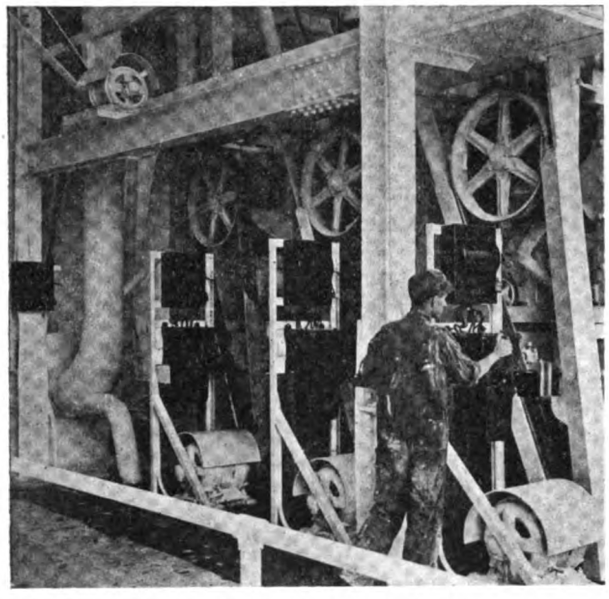
extended use of this agency. The total fire loss from electricity has this significance, that protective devices for electricity and educational efforts to ensure care in its use have not kept pace with its adoption. Furthermore, losses caused by electricity are increasing only relatively in proportion to total losses. Fire losses in the United States in 1918 were greater in the aggregate and also per capita than in any of the preceding 44 years, except in 1906, the year of the San Francisco fire. Two-thirds of our fires are preventable. We have got to make electricity safer, not only in the factory but in the home.

What are some of the conditions that cause an electrical fire or accident hazard? To go away and leave an electric iron 'on' will obviously cause a fire, it was responsible for the majority of fires caused by electricity last year.

For a layman to replace switch-fuses with wire of improper amperage is dangerous, as an overload is likely to heat the wiring in contact with inflammable material and thus set fire to the building. Improper installation of wiring and electrical equipment without authoritive inspection is another cause.

An exposed switch even if it is on a 110-volt service-line



Switch Affording Complete Protection

is dangerous. For instance, somebody may inadvertently stand a rake against the switch and cause a short circuit. Thousands of people have been burned and killed because of electric switches, which were not enclosed and externally operated. An open-knife switch is just as dangerous as an uninsulated wire.

Improper grounding is a hazard. Loose oil is another. Damp places for generators or where there is gas or rubbish is hazardous. Electric arcs from overheated electrical equipment caused by switches with poor contact-points, poor contact in splices and connections, worn insulation, moisture, crossed wires, cause fires. Modern practice encloses wiring in conduits.

Temporary wiring should never be allowed to be continued as permanent. Sparks from exposed commutators ignite gas, dust, and lint. Portable and pendant lamps often develop defective insulation that cause short circuits. Incandescent lamps should never be placed near inflammable material. Paper lamp-shades are dangerous.

Large fires are sometimes caused by transformers, oil-switches, and lightning-arresters being ruptured under heavy load and the burning oil being scattered over surrounding material.

Educationally, the big idea to sell the users of electric current—and that class includes everyone from the Slav newly arrived from Eastern Europe to the farmer of northern Dakota—is that competent electricians only, should install the service, make repairs, and inspect its condition. The amateur has no more business experimenting with electricity than he has experimenting with drugs.

Statistics, furnished by a chain of public utilities in the Middle West, reveal that

20.8% of all lost time arose from accidents caused by electric current.

61.6% of accidents from electric current caused lost time.

70% of accidents causing disabilities of 30 days or longer occurred to linemen, and were largely due to electric current.

71% of the total amount of money expended for compensation and accident costs was paid for accidents caused by electric current.

Is electricity dangerous? Not if properly safeguarded. Not if the inexperienced realize and understand its danger.

A great many municipalities and State departments realizing the necessity for compelling the careless user to protect himself, have officially ruled that no installation shall be made in their jurisdiction unless approved by city or State authorities. Some even go so far as to specify that certain types of protective devices must be used. The following extract taken from a General Order issued by the State fire marshal of Ohio, shows this tendency.

"In an effort to safeguard the lives and property of the State of Ohio, I hereby make and promulgate the following ruling with reference to the installation of approved safety electric switches, effective October 15, 1919.

"In order to reduce to a minimum the loss of property by fire, caused through the utilization of open-knife switches and automatic cut-outs, this department will refuse to approve any new or altered electrical equipment unless the same complies with the following requirements:

"1. That the service-switch be of the enclosed safety-type.

"2. That it operate outside of enclosure.

"3. That the 'on' or 'off' position be marked.

"4. That it can be locked in the 'off' position.

"5. That all starting-devices on motors be of the enclosed-switch type."

FIGHTING FIRE WITH FIRE

The literature of the pioneer days in the prairie States is replete with stories of emigrants who, finding themselves in the path of a prairie fire, resorted to the expedient of lighting another fire which cleared a refuge before the on-coming rush of flames could harm them. Modern fire-fighters today combat flame with flame, but in another way. No up-to-date fire department is without its oxy-acetylene apparatus for cutting away metal obstructions that may be interposed between the firemen and expeditious performance of their work. It may be a grating or an iron door that must be wrecked at a moment's notice to admit the passage of the hose and men, or to afford a feasible entrance for rescuers. Ax, crowbar, and sledge are of little avail against steel and iron. Work that would require hours with these implements must be done in minutes. And it is done. The fire departments now use the oxy-acetylene torch, the only device that has been found adequate to the emergency. By use of the cutting blow-pipe no metal barrier can stand long in the way of the modern fire-fighter. His outfit is easily portable so that he can work with it at the critical point at the moment it is needed. There is no delay. It is ready to use when it is brought to the work. Usually it consists of an Oxweld metal-cutting blow-pipe, a cylinder of Linde oxygen, and a Prest-O-Lite tank of dissolved acetylene.

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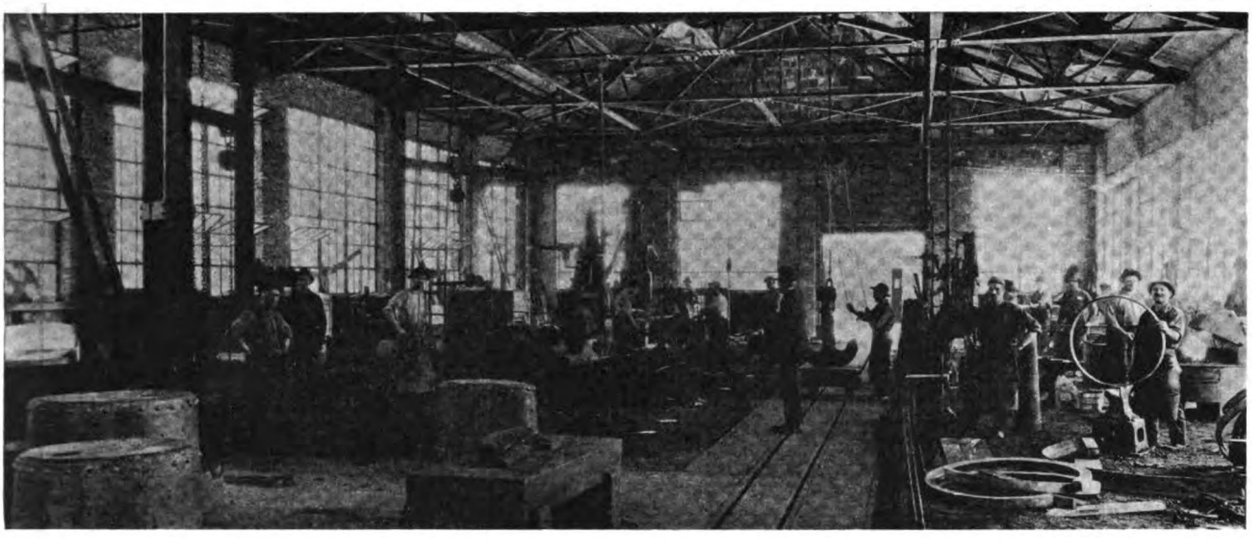

Interior of the Whiting Foundry Equipment Co.'s Forge-Shop

FORGE-SHOP OF THE WHITING FOUNDRY EQUIPMENT COMPANY

The mill-type forge-shop here illustrated is an example of the forward movement in the iron and steel industries to provide better working conditions for employees. The unique arrangement of small doors at the ground-level, extending all round the building, in connection with ample windows and a monitor running full length of building, provides perfect ventilation and makes it possible to maintain a comfortable working temperature. The fires are also arranged so that the smiths are not working in line of any furnace, and the Buffalo down-draft system eliminates smoke. The result is that men are not exhausted after a hard day's work.

The shop equipment consists of steam-hammers, furnaces, a pneumatic bulldozer, and smaller tools. The exhaust from the steam-hammers is returned to the heating plant in winter. Electric, pneumatic, and steam power are available. Oil, gas, coke, and coal are supplied for fuel.

This shop is equipped to handle light and heavy forgings of various kinds, including crane-hooks from 1 to 200 tons capacity. A 5-ft. cement-walk with narrow-gauge track for shop-trucks, runs through the middle of the shop from end to end. A 30 by 30-ft. cement floor with 6 by 6-in. oak timbers, 30 in. centre to centre, is provided for ladle-work and for bending rails, plates, angles, and channels.

OXY-ACETYLENE IN THE FOUNDRY

The oxy-acetylene department in the modern foundry is now as much a matter of course as the pattern-shop or finishing-room. The blowpipe is the accepted tool for cutting off steel risers because of its economy and speed, and in operations such as filling in blowholes and building up defective castings it is indispensable as a source of saving, and also because the oxy-acetylene weld, being free from hard spots, contributes to ease and finish in machining.

Repair of broken castings, while not so important in the foundry as elsewhere, because patterns are usually available for making new castings and because the material costs are not so high as for completed machinery, is nevertheless common wherever castings can be welded more cheaply than they can be replaced. This has led to provision being made in most foundries for preheating whenever the work is such that the application of a welding heat would set up stresses in the casting.

The modern foundry lends itself admirably to the production of quality acetylene welding. As a rule annealing-ovens are ready for the initial preheating; brick and coke are present for the building of ovens to provide final heating and annealing; and men experienced in the control of expansion and contraction are always at hand to supervise the work.

In many foundries, special spaces are reserved for the welding and cutting operations. An ideal procedure, where floor-space is available, is to remove the castings from the molds, take them to a regular place for rough cleaning, next to a separate space for cutting off risers, and finally to the grinders for finishing, where the defective castings are sorted out for removal to the welding division. An orderly and simple mode of handling the castings is to use storage-battery trucks, cranes, or monorail hoists carrying separate frames for the loads. In this way the frames may be loaded where the work is done, special work being kept to itself, and the loaded frames picked up and deposited in the spaces assigned for succeeding operations.

Acetylene may be supplied either by generator or cylinder, and oxygen may be taken from individual cylinders or from a pipe-line fed from a manifold. In building new foundries it is advisable to use welded pipes for the distribution of gases and compressed air. Large-diameter pipe used with either low-pressure exhaust or supply fans should be welded to prevent leaks, which cause daily waste by increasing the power required to run the fans. The saving in power soon pays for the entire system, and welded pipe is both cheaper and better than riveted pipe.

Besides cutting steel risers filling blowholes, building up defective castings, and repairing broken castings, a number of other operations can be done with oxy-acetylene or oxygen, such as scaling castings, cleaning ladles, burning salamanders, and welding pipes, tools, structural shapes and machinery-guards.

In scaling castings a welding-flame is applied to the refractory silica-scale, which has a different expansion from that of the iron and cracks readily just as does the enamel of a bathtub when heated, making it easy to remove. This eliminates hammering and is a great time-saver. It also makes the work less laborious.

Oxygen is used successfully in clearing refuse metal and slag from electric and gas furnaces. It is better than using bars and sledges, is easily and cheaply applied, and contributes to neatness in the foundry. Steel work that is bent out of true can be bent back into form by playing a large oxy-acetylene welding-flame over the metal and using a sledge after a red heat is attained. This applies to both structural and sheet steel.

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THE HENDERSON-DITTY CORE-OVEN

By co-operation between C. M. Henderson of the H. C. Macauley Foundry Co. and Ditty Bros., Inc., an improved core-oven has been developed, which is being made at the Macauley foundry at Berkeley and is being distributed by Ditty Bros. The drawers of the oven travel on rollers, and run on a steady supporting bar when open, making them easy to handle. Each drawer can be opened separately for loading and unloading, a plate at the back of the drawer closing the opening so that no heat can escape. Each drawer operates independently of the rest and can be loaded or unloaded while the oven is in operation without any loss of efficiency. The standard drawer is 3 ft. square by 12 in. high. Other sizes can be made to order. Good distribution of heat in the oven is obtained, giving a uniform temperature, quick baking, low fuel consumption, and consequently low operating cost. The castings are machined at the joints, fitted, and assembled before shipment. The oven is built for either coke or oil.

NEW COOLING-RING AND ELECTRODE ECONOMIZER DEVELOPED FOR GREAVES-ETCHELLS FURNACE

The gases generated in an electric furnace during operations are combustible only at high temperatures. Nearly all the present-day cooling-rings have for their principal object the cooling of the electrode and the cooling of the port-holes of the roof, which means that if these gases escape to the atmosphere, they are hot enough to burn, and in doing so, burn part of the electrode itself, and also have an objectionable effect on the electrode-holder.

In the cooling-ring designed recently for the Greaves-Etchells furnace the engineers of the Electric Furnace Construction Co. have obtained the desirable feature of keeping the roof port-holes cool, keeping the electrode reasonably cool, and go still further by cooling the gases as they leave the furnace to a temperature at which they will no longer burn when they meet the oxygen of the atmosphere.

While these gases are inside the furnace, they are under reducing conditions, and have, therefore, only their own sensible heat and no heat generated by the oxidation of combustible constituents. These gases pass, first of all, in between the electrode and the port-hole of the roof, and then pass through a clearance in the cooling-ring and into a relatively larger chamber, which causes the expansion and consequently cooling of the gases. From this chamber the gases are once more contracted through a small clearance, and then pass to a large chamber for a second and much larger expansion. This chamber is surrounded, in the case of graphite electrodes, by a thin enclosed cover, which, in actual practice, has been found sufficient to dissipate the heat given up by these gases, and when they finally pass through the last clearance, the temperature is not sufficiently high to cause them to burn in the atmosphere.

When such economizers are to be used on amorphous-carbon electrodes, and especially of the larger sizes and of the makes where the diameters do not run to any regularity, a change is made in the second chamber of the economizer. The gases there, instead of being all allowed to pass through the clearance, pass through perforated plates on the outer wall of the cover, and by keeping these perforations as small as practicable, the plates act on the principle of the metallic gauze used in the Davy miner's lamp. The cover is adjustable, so that the distance can be altered to suit working conditions.

The use of this electrode economizer considerably decreases the electrode consumption. The bull's eyes in the roof also appear to stand up much better. This is probably due to the blanketing effect, and to the fact that the flames do not rush out through the roof. There is much less tendency for the electrodes to taper off, and they burn square right to the point of the arc. This means that the electrode always has the correct carrying capacity at its extremity.

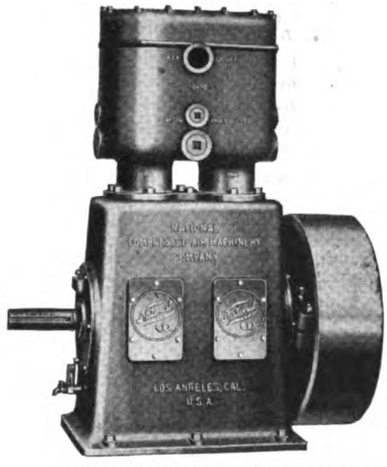
In cases where economizers are not used, the air coming in through the furnace-doors strikes the white-hot electrode and the roof-openings act as a chimney, the electrode burning away and penciling off. When the tip of the electrode is thus reduced, it has often to carry much more current than that for which it has been designed. Consequently, the electrode heats unduly throughout its length and breakages of electrodes and connecting nipples frequently occur. This is largely prevented by the use of economizers. The saving in wear and tear of the copper cables, electrode-arms, electrode-holders, and general overhead-gear of the furnace is considerable.

The standard form for electrode-economizers has a flat bottom, but where the roof is arched, they can be made to conform to the curvature of the roof.

NATIONAL AIR-COMPRESSORS

Air-compressors, in sizes from ½ to 150 hp., are being manufactured in Los Angeles by the National Compressed Air Machinery Co. The compressors are constructed in two general types; the single-cylinder Class 'S' machine is for light work; the two-cylinder Class 'D', 'D2S', and 'DVL' are designed for those whose requirements are greater. The duplex types are made in a wide variety of sizes and for pressures of from 10 to 500 lb. per square inch. The leader in the duplex type is the Class 'D', two-cylinder, single-stage, single-acting, as illustrated in the accompanying cut.

Some of the features that distinguish this machine from other makes that look about the same are as follows: The main bearings are three in number, all adjustable by the removal of laminated shims, and any one removable without disturbing any other. Equally important these bearings are carried on heavy bridges cast in the main frame. The cross-head guide is free from stuffing-box troubles and the cylinder walls get no side-thrust wear. Lubrication is by splash only. There is not a lubricator, oil, or grease-cup on the compressor. The cylinder wall lubrication is controlled by the apron, on the piston, dipping into a groove kept filled with oil by the cross-head. Enough without too much is the answer to the cylinder-lubrication problem in this design. National arch-disc valves are used in all National air-compressors. They are guaranteed for two years against breakage in use. Inlet and outlet valves are interchangeable. They are a happy medium between the old, self-destructive poppet valves, and the host of frail, and in many cases complicated, so-called plate valves. While being efficient and silent, they stay tight and they 'stand the gaff'. There are



Class 'D' National Air-Compressor

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no extra parts, such as buffers, stop-plates, guides, or washers. For each valve there is but one spring, one cap, and nothing else. Both the single and two-cylinder are furnished bare, or in complete assembled outfits, including motor or engine drive, pressure-unloader, and electric, pneumatic, or other types of control, as best suits the user's conditions.

SIMPLE DEVICE FOR STRIPPING OUT INNER STRAND OF STEEL CABLE

An interesting salvaging operation was recently carried out successfully by the Spanish-American Iron Co., a subsidiary of the Bethlehem Steel Corporation, in Cuba. The inner strand of a three-inch steel cable which had been condemned and discarded because of worn and frayed outer strands was salvaged and the worn strands cut into six-foot lengths for the charging-box. Both the inner strand and the scrap were well worth saving, as the cable was a mile and a quarter long and the reclaimed strand (1¼ in. diam.) was practically as good as new.

The problem involved was to cut away the six worn strands without damaging the valuable inner strand. This was accomplished by means of a simple but ingenious device constructed on the ground out of scrap material. Suitable lengths of iron pipe, of a size convenient to grip with the hand, were oxwelded into the rim of a small iron pulley in such manner as to resemble spokes of a wheel with the tire and felloes missings. A short section of sheet-iron pipe, slightly smaller in diameter than the pulley but larger than the shaft bore, was then welded to it in line with the bore by the use of four strips of strap iron.*

The strands of the cable were then pried apart for a few feet to admit of passing the inner strand through the hub and its extension, and the feeding of the outer strands through the six spaces between the spokes. With the strands so adjusted the device was revolved against the wind of the cable and advanced as the strands unwound, the inner strand being allowed to lie in a continuous length along the course of the work and the worn members being easily cut into the proper lengths with the oxy-acetylene torch. The length of the spokes gave the necessary leverage for operation of the device by hand. The cable, of course, remained stationary, the inner strand being coiled and the scrap collected after the work was completed. The job was done in jig-time, the oxy-acetylene flame snipping off the worn strands with almost chopping speed.

The use of the oxy-acetylene cutting, which was done with a portable Oxweld outfit, made simple and inexpensive an operation that would have been prohibitive by any other mechanical means, as it was equally out of the question to carry shears of sufficient power to the work or to convey the work to the shears. Thus the salvaging was accomplished with dispatch and economy, netting the owners of the cable a handsome profit on material that could not have been profitably reclaimed by any other process.

*The use of the pulley and pipe-extension was necessary only because a suitable length of pipe was not at hand. A single section of pipe of the right size to allow for welding in the spokes and long enough to keep the inner strand from curling would be much simpler and would answer the purpose equally well.

LIGHT AND SAFETY

By C. W. Price

Some one has said "Light is a tool that adds to the efficiency of every other tool". The modern industrial manager goes a step farther, for he realizes that adequate lighting, both artificial and natural, is indispensable not only to efficiency but also to safety. He knows that the dark plant is the dangerous plant. One of the large insurance companies made a careful study of the reports of 91,000 accidents and discovered that 9100 accidents were caused directly by the absence of proper lighting, and that for 12,000 more accidents inadequate lighting was found to be a contributing cause.

The British government in an extensive investigation of accidents found that stumbling and falling are the most frequent reasons for accidents caused by the absence of light. The report of the United States Census Bureau for 1918 says "The greatest number of deaths charged to any one accidental cause, 10,330, is shown for falls." The investigation of the British government also revealed that during the four winter months, deaths and serious injuries caused by falls were 39½% greater than during the four summer months, thus showing the bearing of light on this class of accident.

In all of the industries where efficient safety work is being done and where large reductions in accidents have been made, strong emphasis is placed on good general illumination of all departments. Investigations conducted by one of the leading illuminating engineers of America in 200 plants in which modern lighting systems were installed showed that where rough work was being done, as in foundries and steel mills, the total output was increased 2%, while in textile mills, shoe-factories, machine-shops, and other industrial plants where fine work and close application were required, production has been increased 10% by the installation of proper lighting equipment. The economic value of good lighting becomes readily apparent when it is known that the overhead cost of adequate lighting is not more than ½% of the payroll.

Industrial managers are coming to realize that light not only increases output and decreases accidents, but also plays an important part in making the plant a cheerful and pleasant place in which to work. In these days when management is giving the most serious attention to the attitude of men toward their work and to questions of contentment and loyalty, a plant that is light, cheerful, and attractive has a great advantage over the dark, cheerless, and unattractive plant.

Light has a positive influence in encouraging orderliness, cleanliness, and efficiency. In a plant where the windows have been washed, the walls whitened with paint especially designed to reflect light, and an effective lighting system installed, there has followed, almost invariably, a housecleaning on the part of both foremen and workmen, all of which makes for efficiency, safety, and contentment.

ORGANIZATION OF INTERNATIONAL CHAMBER OF COMMERCE

The first meeting of the International Chamber of Commerce was held at Paris early last month. There were 500 delegates from the five countries that participated last fall in the International Trade Conference, namely, Belgium, Great Britain, France, Italy, and the United States. Representatives of business in other countries will be invited to become members later. The following summary includes the more important questions under discussion:

Restoration of international credit, based on fixation of the amount and the conditions of payment for the debts of all countries, allies, or enemies, was urged.

It was resolved that allied states should agree also as soon as possible to fix definitely the amount and conditions of payments according to the stipulations in the treaty.

There should be an avoidance of duplicate taxation of wealth of individuals or organizations in more than one country.

There should be reduction of unnecessary expenditures on the part of local and national governments.

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Extension of credits, uniform banking laws, and war damages were considered.

Reciprocal international treaties relative to import and export taxes were advocated.

An international credit bureau was planned.

National and local chambers of commerce were requested to co-operate with their governments to reduce national and local governmental expenditures.

Governments and banking, commercial, and industrial associations in all countries were urged to co-operate with the International Chamber and with each other to reduce importation of non-essentials by countries whose exchanges are depreciated and to increase exportations from such countries.

There should be an endeavor to obtain the co-operation of labor to prevent delay in the turn-around of ships, delay between ships and trains, and delay in transportation by rail.

There should be restriction as far as possible upon the issuing of foreign loans by countries whose exchanges are depreciated.

There should be a reconstruction special committee to study the exchange situation.

There should be inducement of foreign investments in home countries.

There should be encouragement of tourists through removal of unnecessary restrictions.

It is desirable to furnish raw material and credits.

There should be facilitation and simplification of passport procedure.

A committee was proposed to investigate the mischevious use of trade-names and of misleading indications.

Common nomenclature was proposed for customs tariffs of the allied nations.

Revocation of import and export prohibitions was urged as soon as the internal conditions of each country will allow.

A resolution petitions the Board of Directors to establish a central bureau for international statistics covering production with forecast of output and probable needs of each country.

The world's stock of fuel was discussed.

A resolution urges hastening of utilization of hydro-electric power, development of measures for the use of mineral fuel scientifically and economically, and development to the utmost of research in the extraction of coal and oil resources of the world.

The full meeting expressed an opinion that Germany had not demonstrated an intention to fulfill its obligations to the Allies, as agreed in the Treaty of Versailles. Allied governments were urged to tolerate no further delay in the carrying out of the treaty agreements.

The next meeting of the International Chamber will be held in London, next June. Temporary headquarters have been established in Paris. The place of the permanent headquarters is left to the Board of Directors.

The Chamber elected the following officers and directors: president, Etienne Clementel, former Minister of Commerce in France, and member of the Supreme Economic Council; vice-presidents, A. C. Bedford, New York; Baron Edouard Empain, Belgian banker; A. J. Hobson, Sheffield, England; Vitorio Rolandi Ricci, Italy; directors, for Belgium: Edgar Castelain, William Thys, Canon LeGrand; for France: Eugene Schneider, Georges Pascalis, M. Coignet; for England: Sir Arthur Shirley Benn, Walter Leaf, J. G. Jenkins; for Italy: Marco Cassin, Luigi della Torre, Commander Giorgio Mylius; for the United States: John H. Fahey, Willis H. Booth, Edward A. Filene; temporary secretary-general, M. Dolleans, Professor of Political Economy at the University of Dijon.

A CONSTITUTION OF INDUSTRIAL RELATIONS*

Introduction

The strict application of the injunction, "thou shalt love thy neighbor as thyself", would solve most of the ills incident to human relations. No further statement of principle would be necessary.

But as men are constituted, while a considerable proportion of them would admit the righteousness of the injunction, few could lay claim to using it as an unvarying guide in daily practice. This, after all, is merely another way of stating that humanity is still very far from achieving perfection.

Hence, it is encouraging to find that, in frank recognition of their ethical limitations, various groups of men are reaching out in the endeavor to discover and to establish principles that, while constituting an approach to an ideal not yet fully attainable, will meet the conditions of an imperfect present.

Evidence of this is most clearly observable in the struggle to interpret and to establish relations between employers and employees. Here is needed a declaration of principles so basic, so wide in scope, so fair in application, so clear in expression, that it may be accepted as a constant measure of the justice and wisdom of the temporary devices that must be framed to meet fluctuating conditions.

Such a declaration the undersigned Committee has widely, but unsuccessfully, sought. The closest approach to it they have found in the Statement of Principles enunciated by the Chamber of Commerce of the United States, (February 2, 1920) and included in Referendum No. 31 on the report of the committee on Industrial Relations regarding employment relations (June 9, 1920).

A multitude of tongues saying the same thing in different ways, produce nearly as much confusion as if they were saying different things. In this belief, the Committee has felt that the ends of clarity and uniformity would best be met by adopting the form and phraseology of the United States Chamber of Commerce Statement, modified by the omission of details, but retaining the fundamental principles that underlie all employment relations.

That statement, therefore, with such changes as will serve to increase its applicability, is offered in the following pages.

It is the Constitution of Industrial Relations. It is the standard of measure for the special rules, or Statutes, that must be framed for the specific industry concerned.

Fundamental Principles of Industrial Employment Relations

Preamble

Employment relations should accord with and express ideals of justice, equality, and individual liberty. The terms of employment should conform to the essential requirements of economic law and should, through intelligent co-operation, based on a recognition of mutuality of interest, conduce to high productive efficiency. They should reflect an effort to realize ideals of individual and social betterment.

The interest of the public, which includes every individual in the community, is paramount. It is composed of interdependent interests whose just balance necessitates that impartial justice be accorded to every individual.

There is a mutuality of interest among employers, employees, and investors. Their interests as well as the public interest must be defined and protected and to this end public opinion must be kept informed and enlightened.

The first step toward industrial peace will be a realization of the interdependence of all elements related to industry and a recognition of their responsibility one to another.

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*Proposed by Committee on Labor of Associated General Contractors of America.

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In government and public service employment the orderly administration of government must be assured, and the paramount interest of the public protected.

Briefly stated, Justice to all interests, Co-operation between employer and employee, produces Service to the public.

Principles

I—The Employment Relation

Every person possesses the right to engage in any lawful business or occupation and to enter, individually or collectively, into any lawful contract of employment either as employer or as employee.

II—The Open Shop

The right of employer and employee to enter into and to determine the conditions of employment relations with each other (without reference to the affiliation or non-affiliation of either with any organization) is an individual right of free contract possessed by each of the parties.

III—Right of Association

All men possess the equal right to associate voluntarily for the accomplishment of lawful purposes by lawful means. The association of men whether of employers, employees, or others, for collective action or dealing, confers no authority over and must not deny any right of those who do not desire to act or deal with them.

IV—Responsibility of Combinations

The public welfare, the protection of the individual, and sound employment relations equally require that all associations or combinations be subject to the authority of the State. As the public interest is paramount, full publicity of facts of industrial relations is necessary.

V—Obligation to Secure Production

To develop, with due regard for the health, safety, and well-being of the individual, the maximum capacity and output required of industry is the common social obligation of all engaged therein.

VI—Wages and Management

The wage of labor must be drawn from the product of industry and must therefore be earned and measured by its contribution to production. All employees are entitled to complete business information in matters affecting the terms of their employment; and frankness is essential. In order that the worker, in his own and the general interest, may develop his full productive capacity, it is the duty of management to assist him to secure regular employment suited to his abilities, to furnish him with incentive and opportunity for self improvement, and to provide proper safeguards for his health and safety.

VII—Hours of Labor

The number of hours in the work day or week in which required maximum output, consistent with the well-being of the workers, can be maintained in a given industry should be ascertained by careful study and never should be exceeded except in case of emergency. One day of rest in seven, or its equivalent, should be provided.

VIII—Adjustment of Employment Relations

Adequate means satisfactory both to the employer and to his employees, and voluntarily agreed to by them, should be provided for mutual discussion and adjustment of employment relations.

IX—Community of Interest

The greatest measure of reward and well-being for both employer and employee, and the full social value of their service to the public must be sought in the successful conduct and full development of the industrial establishment in which they are associated. Intelligent and practical co-operation based upon a mutual recognition of this community of interest constitutes the true basis of sound industrial relations.

X—Government Employment

The State is sovereign and cannot tolerate a divided allegiance on the part of its officers and servants. While the right of government employees, national, State, or municipal, to be heard and to secure consideration and just treatment should be amply safeguarded, the community welfare demands that no combination shall be permitted to prevent or impair the operation of government or of any governmental function.

XI—Public Service Employment

In public service activities the public interest and well-being must be the paramount and controlling consideration. The power of regulation and protection exercised by the State over the corporation should properly extend to the employees in so far as may be necessary to assure the adequate, continuous, and unimpaired operation of public-utility service.

The Committee on Labor of the Associated General Contractors desires the greatest possible publicity and discussion of the foregoing statement. It invites constructive criticism in order to perfect this draft, if necessary.

It is hoped that it may ultimately be widely adopted as the guide for all industrial employment relations.

Book Reviews

Elements of Steam and Gas Power Engineering. By Andrey A. Potter and James P. Calderwood. Pp. 297. Ill., index. McGraw-Hill Book Co., Inc., New York. For sale by 'Mining and Scientific Press'. Price, $2.50.

This book is designed primarily as an elementary textbook for engineering students but could also be used to advantage by others interested in the subjects discussed. The first chapter is devoted to the fundamentals of power engineering, following which the various divisions of steam power-plant work are discussed including engines, turbines, boilers, auxiliaries and accessories, a chapter being devoted to each of the principal divisions of the subject, including power-plant testing. Internal-combustion engines are next considered, including general engine-design, fuels, and auxiliaries, particularly carbureters and ignition systems. Chapters are also devoted to locomotives, and to automobiles, trucks, and tractors.

Structural Drafting and the Design of Details. By Carlton Thomas Bishop. Pp. 338, ill., index. John Wiley & Sons, Inc., New York. For sale by 'Mining and Scientific Press'. Price, $5.

This is a textbook for students and apprentices and a reference book for structural draftsmen. It is divided into three parts. Part I is introductory and gives a general discussion of the organization of a structural-steel company and of the manufacture and fabrication of structural steel. Part II is devoted to drafting-room practice. The discussion is complete, from the mechanical details of the use of tracing-cloth and ink-erasers to the laying out of beams, girders, and columns. Part III deals with the design of details in a similarly thorough manner. An appendix contains the usual data regarding properties of standard structural shapes as well as a number of other tables and diagrams useful in this class of work.

Retaining-Walls. By George Paaswell. Pp. 269. Ill., index. McGraw-Hill Book Co., Inc., New York. For sale by 'Mining and Scientific Press'. Price, $4.

The construction of retaining-walls dates back to pre-

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historic times, but, as the author points out, scientific design is comparatively modern, while the increasing use of reinforced concrete calls for something more accurate than the empirical methods frequently used with the gravity-wall. The present volume is divided into two parts of approximately equal length. Part I, after discussing the various methods of computing earth pressures and surcharges, considers gravity-walls, reinforced concrete walls, and various special wall-sections. A chapter is also devoted to temperature, shrinkage, and other factors of general influence. Part II, on construction, discusses the plant required, formwork, and general methods of constructing both concrete walls and walls other than concrete. Architectural treatment, drainage, waterproofing, surveys, and office work are also considered. An appendix contains skeleton specifications and a bibliography. The book will be of value to anyone designing or constructing a retaining-wall.

Popular Oil Geology. By Victor Ziegler. Pp. 166. Ill., index. John Wiley & Sons, Inc., New York. For sale by 'Mining and Scientific Press'. Price, $3.

That in two years a second edition of this little book has become necessary is in itself an indication of its usefulness. The preface states that the book is designed for the man without technical or scientific training. As such it gives a sort of birdseye view of the subject with particular reference to the Mid-Continent and Rocky Mountain fields. The first chapter is devoted to the general history and statistics of the petroleum industry. The next discusses the physical and chemical properties of oil and gas, following which there is a brief discussion of the various theories of the origin of oil and gas. Several chapters are then given to a discussion of those geological phenomena that affect the migration of oil, and to the application of a knowledge of these phenomena to prospecting for oil. A chapter is devoted to the oil-shale industry and the final chapter discusses oil investments. The principal differences between the second edition and the first are the rewriting of the chapters on oil-shales, the migration of oil and gas, and the anticlinal theory.

Forge Practice and Heat-Treatment of Steel. By John Lord Bacon. Third edition. Pp. 407. Ill., index. John Wiley & Sons, Inc., New York. For sale by 'Mining and Scientific Press'. Price, $1.75.

The author of this book was for some time instructor in forge practice at the Lewis Institute at Chicago, and the text is based on notes prepared for courses given there. In the third edition the subjects of hardening, tempering, and annealing are treated at considerably greater length than in the previous editions. The first chapter is devoted to a general description of the blacksmith's forge and tools. Welding in the forge is next discussed, and then the making of all kinds of hand forgings, including the calculation of stock, and the methods of actually doing the work. Steam-hammer work is then considered, also the use of dies to produce duplicate parts. The remainder of the book is mainly devoted to tempering, hardening, annealing, and casehardening, and discusses both the equipment used and the methods of doing the work. The treatment is non-technical and practical throughout, theoretical discussion being eliminated as far as possible. It will be of value not only to the apprentice and mechanic but also to the engineer who either uses or has charge of the manufacture of forgings.

The Barber-Greene Co. manufacturer of belt-conveyors and self-feeding bucket-loaders and other equipment for handling material, announces the following organization of its sales force. R. E. Foulke, 404 3rd National Bank Bdg., St. Louis; J. A. Gurney, 605-606 Arrott Bdg., Pittsburgh; F. S. Sawyer, 1010 Penn Square Bdg., Philadelphia; and W. T. MacDonald, 305 Merchants Bank Bdg., Indianapolis.

Trade Notes

J. S. Baird is moving his brass foundry from San Francisco to Martinez.

Kloeres & Koch have opened an ornamental-iron shop at 943 Columbus avenue.

L. D. Stoff is building a one-story brick machine-shop on Eddy street near Hyde.

The keel of the battleship 'Montana' was laid at Mare Island Navy Yard on July 4.

The Pacific Power & Light Co. will construct a $1,000,000 power-plant at Astoria, Oregon.

The G & B Machine Shop, operated by Messrs. Graib and Barnett, has been opened in Martinez.

The Burns Foundry & Machine Shop at Pendleton, Oregon, is making additions to its plant.

The Electric Furnace Construction Co. has moved its main offices to 908 Chestnut street, Philadelphia.

The Johnson Gear Co. has purchased a Pangborn automatic sand-blast table from **Ditty Bros., Inc.**

The new plant of the **Western Pipe & Steel Co.** at Phoenix, Arizona, will be ready for occupancy about August 1.

The telephone number of **Ditty Bros., Inc.,** 140 Howard street, has been changed from Garfield 612 to Garfield 1340.

The California Fish Canning Co. has let a contract for a new cannery to be erected at Monterey at a cost of $40,000.

The Standard Gas Engine Co. has completed the permanent organization under its plan for employee representation.

A one-story brick building is being erected for the **Snedden Machine Works,** at 1968 South Los Angeles street, Los Angeles.

A one-story brick garage and salesroom is being erected on 11th street near Mission for the **S. F. Kruger Supply Company.**

The Maynard-Adams Engine Co., of Berkeley, has been shipping a number of its 3½-hp. marine engines to Japan for use in fishing-boats.

The Pacific Gas & Electric Co. will spend $225,000 on the reconstruction of its transmission-line between the Drum and Colgate power-houses.

The Madsen Iron Works, of Huntington Park, California, has poured the first heat in its new foundry. The equipment was furnished by **Ditty Bros., Inc.**

Receipt of additional equipment will permit the **Clark-Turner Piston Co.,** of Los Angeles, early in August to bring its output to 3000 pistons per day.

L. G. Perkins, of Fresno, California, is building a new foundry to make gray-iron castings. This is being completely equipped by **Ditty Bros., Inc.**

The Piedmont Winery building on Beach street between Hyde and Larkin streets, San Francisco, has been leased by the **International Milling Corporation.**

The Northwest Bridge & Iron Co., of Portland, has commenced work on two of the seven 12,000-ton tank-steamers it is to build for the Swiftsure Oil Company.

The Llewellyn Iron Works, of Los Angeles, is building a new iron foundry. A 78-in. cupola together with other equipment was purchased from **Ditty Bros., Inc.**

The 'Red Hook', the first steel vessel to be constructed for private account at the Tacoma yard of the **Todd Shipbuilding & Drydock Co.** was launched on June 30.

Andrew J. Carrigan, vice-president and general manager of Dunham, Carrigan & Hayden, has retired after a service of 34 years. He still retains his interest in the firm.

Contract for furnishing four cargo-handling cranes to the port commission of Astoria, Oregon, has been awarded to the **McMyler-Interstate Co.,** of Cleveland, for $83,878.

The Stockton Tractor Co. has decided to move its plant from Stockton to Sacramento. A building costing $40,000

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will be erected. Glanville Hart is president and general manager.

The Pomona Manufacturing Co., of Pomona, California, is enlarging the capacity of its foundry and has purchased a 66-in. cupola from Ditty Bros., Inc., together with other equipment.

One of the National tractor shows will be held at Verdugo Park, near Los Angeles, September 20 to 26. This is the first time a National show has been held west of the Rocky Mountains.

Wildberg Bros., metallurgists of San Francisco, have purchased and will operate the Chapman smelting works in South San Francisco. The remodeling of the plant has been commenced.

The American Coin Register Co. has nearly completed its new concrete building on land adjoining the present plant at Emeryville and has moved several departments into the new building.

Through a typographic error, the office of John B. Matthews, consulting engineer and marine surveyor, was stated to be at 16 California street. It should have been 24 California street.

Herbert's Machinery & Supply Co. has moved its San Francisco office and salesroom to a new two-story brick building at 135 First street. The company will occupy the entire building.

The American Manganese Steel Co. announces that Walter Brinton, who was manager of its plant at New Castle, Delaware, for several years, has been elected vice-president of the company.

George S. Forderer, president of the Forderer Cornice Works, has consented to act as the referee of the opening race on the new $250,000 automobile speedway just completed at Fresno.

The Hermosa Glass Factory, Hermosa Beach, will be ready to begin operations about August 10. The plant cost $110,000 and will employ 250 men in the manufacture of high-grade window-glass.

Contract for the construction of a suspension bridge across the Rogue river near Grants Pass, Oregon, to carry water for a new irrigation project has been awarded to the Portland Bridge Co. for $23,000.

The first number of 'San Francisco Business', the new official organ of the San Francisco Chamber of Commerce, appeared July 2. It is an attractive weekly devoted to business news of the city and State.

The James Graham Manufacturing Co., stove manufacturers, of Newark, California, is installing an enameling plant. A feature of this is a Pangborn automatic sand-blast room purchased from Ditty Bros., Inc.

The H. H. Robertson Co., formerly the Asbestos Protected Metal Co., of Pittsburgh, Pennsylvania, announces the appointment of H. M. Holway as district manager of its San Francisco office, in the Hobart building.

The Roentgen Appliance Co., manufacturers of X-ray apparatus, has moved its principal place of business to the Williams building, at Third and Mission streets, where its factory and sales-room are also situated.

The Ever-Ready Heater Co. has been incorporated by J. B. Reeves, J. O. Smith, and W. G. Duff, all of Los Angeles, for the purpose of manufacturing heaters and heating equipment. The authorized capital is $500,000.

Hooper C. Dunbar, formerly manager of the iron and steel products department for Monroe, Leon & Tees, Inc., has opened an office at 310 Sansome street, as an export and import broker. He will specialize on iron and steel.

The San Diego Cotton Mills Co., San Diego, has been incorporated with a capital of $1,200,000 by T. J. West, D. W. Pontius, W. A. Kolmar, T. W. McDevitt, E. A. Edmunds, Leroy A. Wright, E. B. McKnight, and Dempster McKee. The mill will have not less than 20,000 spindles and 500 looms.

The Moreland Motor Truck Co. celebrated the completion of the process of moving from its old plant on North Main street, Los Angeles, to the new one at Burbank, by holding 'open house' at the Burbank plant on July 23 and 24.

The city of Sacramento has called for bids for the construction of the first unit of its proposed water-filtration plant. The estimated cost of the entire project is $1,818,000, of which $1,592,000 represents construction cost.

The aeroplane-manufacturing and garage business formerly operated as a partnership by Jacuzzi Bros. at 1450 San Pablo avenue, Berkeley, has been incorporated under the name of Jacuzzi Bros., Inc., with a capital of $100,000.

The Bushnell Manufacturing Co. has completed an improved die-casting machine from its own designs, and is at work on three more machines in order to have sufficient equipment to handle its growing business in die-castings.

H. C. White has resigned as factory manager for the Harris Manufacturing Co., of Stockton, in order to devote his entire time to the affairs of the H. C. White Foundry Co. of that city, of which he is president and general manager.

The Brininstool Paint Co. plant at Los Angeles was swept by fire on July 19 causing damage estimated at over $100,000. The Oliver Plow Co.'s plant and some of the sheds of the Southern California Iron & Steel Co. were also damaged.

S. Fleming, chairman of the Board of Directors of the Canadian Collieries, Ltd., was a recent visitor to Seattle. It is stated that he is about to start an investigation of Canadian Pacific Coast cities as a possible site for a big steel plant.

Chas. C. Moore & Co. are distributing a reprint of the paper presented before the American Society of Mechanical Engineers by C. R. Weymouth, chief engineer for the company, on 'Self-Supporting Chimneys to Withstaand Earthquake'.

Stanley S. Turner, of the Clark-Turner Piston Co., of Los Angeles, has returned from an Eastern trip, during which he made arrangements with distributing houses in the principal centres to handle the company's light-weight gray-iron pistons.

Ditty Bros., Inc., have purchased the foundry equipment of the Skinner & Eddy Shipbuilding Co., of Seattle, and are now offering it for sale. The buying of complete foundry plants and disposing of the equipment is now a feature of this firm.

The Southern Pacific Co. will spend approximately $10,000,000 in the immediate future on the enlargement of its shops at Sacramento. New buildings will be provided for the iron foundry, rolling mills, steel foundry, and general shops and stores.

The Skandia-Pacific Oil Engine Co. has completed and is now testing a 550-hp. Werkspoor Diesel engine, which has been purchased by the Standard Oil Co. for use in a tanker now being constructed for that company at the Union Construction Co. shipyard.

The Hall-Scott Motor Car Co. recently sold to Henry Ford two 200-hp. engines for use in a 35-ft. pleasure motor boat. The boat will develop a speed of 40 miles per hour. The company also sold to Edsel Ford a single 200-hp. engine, also for pleasure-boat use.

The San Joaquin Light & Power Co. has completed its new 12,500-kw. steam-electric plant at Bakersfield and will have the new Kerckhoff hydro-electric plant on the San Joaquin river in operation early in August. This will develop 30,000 kw. The completion of the Bakersfield plant has made possible the removal of the restrictions on the use of power by the company's customers.

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The Petruim Sanitary Sink Co. has been incorporated for $150,000 to manufacture plumbing fixtures. The directors are D. D. Anloff and J. W. Wilkins, of Berkeley, and W. C. Goodwin and G. F. Klink, of Oakland. The factory is at 1435 Fifth street, Berkeley.

The National Redwood Co., with headquarters at Lincoln, Nebraska, has bought 24,000 acres of land, mainly in virgin redwood timber, in Mendocino and Sonoma counties, in the vicinity of Gualala, California. F. W. Tomes, secretary of the company, will open offices in San Francisco.

The Tool Equipment Co., Henry F. Jurs, manager, which represents the **Geometric Tool Co.** on the Pacific Coast, has opened a sales-office at 17 Spear street in the Southern Pacific building, with facilities for the proper display of Geometric self-opening die-heads and collapsible taps.

A. J. Frey, formerly Pacifis Coast manager for the Emergency Fleet Corporation, has been appointed general manager for the Los Angeles Steamship Co., which will operate the 'Harvard' and 'Yale', formerly running on this Coast but 'drafted' during the War for Atlantic service.

Contract for the construction of two new buildings for the **Rich Steel Products Co.** in addition to those already erected on the site recently purchased at 38th street and Santa Fe avenue, Los Angeles, has been awarded to the Austin Co. The buildings will have concrete foundations, steel frame, brick walls, and composition roofing. One of them will be 60 by 400 ft. and the other 60 by 800 feet.

The Electric Furnace Construction Co., of Philadelphia, has issued a new and revised edition of its booklet on the Greaves-Etchells electric furnace. A feature of the booklet is the discussion of the new cooling-ring and electrode economizer, described more fully on page 354 of this issue. **A. S. Lindstrom,** 519 California street, is Pacific Coast representative for the company.

The 9500-ton steel steamer 'Apus', the last of five vessels of this type built by the **G. M. Standifer Construction Co.**, of Vancouver, Washington, for the Green Star Steamship Corporation, was launched July 13. The Standifer company commenced building these vessels when its work for the Emergency Fleet Corporation was completed. It is now building three 10,000-ton tank-steamers for the Standard Oil Company.

W. E. Creed, president of the Columbia Steel Co., the East Bay Water Co., the C. A. Hooper Lumber Co., the Alumni Association of the University of California, and very likely a few other organizations of which we have not heard, has added to his string of presidencies by being elected president of the Pacific Gas & Electric Co., succeeding Frank G. Drum, who resigned recently after serving in that office for the past thirteen years.

Readers of the article appearing in the June issue of 'Metal Trades' on the new main offices of the **Western Union Telegraph Co.** at 722 Market street will be interested to learn that the underground pneumatic-tube transmission-lines for messages have been placed in operation between the main offices and several of the branch offices in various parts of the city. This will make it possible to reduce the average time for local messages to forty seconds.

The Columbia Basin Survey Commission has reported that the proposed Columbia Basin irrigation project is feasible. The plan proposed is to divert water from the Pend Oreille river at Albany Falls, Idaho, and carry it in a 130-mile main aqueduct with a capacity of 20,000 cu. ft. per second, to water 1,735,000 acres of land in Franklin, Grant, Adams, and Walla Walla counties, Washington. The estimated cost of the project is $300,000,000 or about $170 per acre.

A 'sea-sled' built by the **Boeing Airplane Co.**, of Seattle, recently made some remarkable speed records on a trip from Seattle to Vancouver, British Columbia, and return by way of Victoria. The time from Victoria to Seattle was 1 hour and 55 minutes as compared with 4½ hours by the regular steamer-schedules. The 'sea-sled' carries as many as 12 passengers. It is equipped with two 200-hp. marine engines, manufactured by the **Hall-Scott Motor Car Company.**

The 'Broxton', one of the two largest wooden vessels ever built, made a successful trial-trip over the regulation Puget Sound course on July 1. An average speed of 11.28 knots was maintained. The 'Broxton' was built by the **Puget Sound Bridge & Dredging Co.** for the U. S. Shipping Board, but has been acquired by the National Oil Co. Her dead-weight tonnage is 5700, length over-all, 314.5 ft., beam, 49.6 ft., and molded depth, 32.1 ft. She has been chartered to the Canadian Trading Co., of Vancouver, B. C., and will be used in the lumber-carrying trade between that port and Australia.

The Union Gas Engine Co. recently sold two engines to the **Queets Trading Co.** of Hoquiam, Washington, for use in its power-boat 'Blazer'. The engines were the company's standard three-cylinder 35-hp. marine type, with 7½-in. bore, 9-in. stroke, and weigh approximately 4825 lb. net apiece. They are fitted with an individual carbureter for each cylinder, which arrangement gives a better distribution of power than the old-style single carbureter and manifold. The 'Blazer' is a 65-ton boat, and, on account of shallowness of the Queets river, on which it is to operate, is designed to draw only 3½ ft. of water.

The Union Gas Engine Co. recently overhauled two boats for the **Burns-Philp Co.**, of San Francisco. These boats are fitted with three-cylinder 110-hp. kerosene-burning 'Union' engines. They are used in the South Sea Island trade to collect copra from the smaller islands and to bring it to a central point for loading on the larger vessels. There are six vessels of this type in service and two of them are brought to Oakland and overhauled each year. The better control of the vessel obtained by the use of internal-combustion engines makes possible navigation along narrow channels between coral reefs, where a sailing vessel could not go with safety.

Slow delivery of materials is delaying the work of equipping the factory of the **Western Aluminum Manufacturing Co.**, of Emeryville. The main building, which is a reinforced-concrete structure, 100 by 170 ft., will be equipped with presses, stamping machines, spinning lathes, and other equipment for the manufacture of cooking utensils from sheet and cast aluminum. The foundry, which is devoted entirely to aluminum casting, has been in operation for several weeks. It is in charge of B. Lacoste, who has had wide experience not only in general foundry work but also in aluminum casting. The foundry is equipped with a tilting crucible-furnace manufactured by the Monarch Engineering & Manufacturing Co., and a home-made stationary crucible-furnace, both furnaces being fitted with S. T. Johnson oil-burning equipment. Temperature-control is assured by the use of a Hoskins pyrometer. The capacity of each furnace is between 150 and 200 lb. Besides casting cooking utensils of various kinds, a considerable amount of jobbing work is being done, including the making of aluminum patterns and other high-grade castings. The company's line of cooking utensils is trade-marked with the 'Service' brand, and will be sold direct to the trade.

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